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ABSTRACT

The widespread introduction of information and communication technologies (ICT) is affecting the skills needed in employment. Programs of vocational education and training (VET) should ensure people have the wide range of skills needed to be employable in these environments. ICT is spreading into more workplaces as a tool for reorganizing enterprises to ensure they create and exploit knowledge more effectively. Examples of new organizational forms made possible by ICT are telework, distributed workplaces; and virtual organizations. One of the most fundamental ways in which ICT is impacting on work is "informatisation", the ability of new technology to create information about work processes that can be used to either empower or control workers. The identification by policymakers of a widespread need for VET in ICT is based on evidence of skills gaps in organizations that rely heavily on new technology. At the level of individual employees in working environments that make use of ICT, the identification of VET needs depends on a clear definition of skill and the use of appropriate methods for analyzing the requirements of employment. Men tend to dominate more highly paid ICT jobs. The need for competitiveness in organizations in which ICT has been introduced can only be achieved by learning in the workplace in the broadest sense. The learning organization captures this concept. (Contains a 110-item bibliography and 47 Internet and Web resources.) (YLB)

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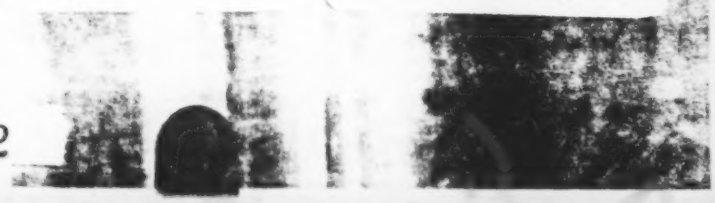

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The need for competences due to the increasing use of information and communication technologies

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Cedefop preface

Needs for competences linked to use of information and communication technologies (ICT) are at present being identified and discussed both at European, national and regional levels. The use of ICT in the workplace is steadily being enhanced, and new and more powerful ICT tools have a strong impact on work organisation and working conditions for individual workers in many sectors. New sectors emerge as result of new opportunities through the use of ICT and multimedia tools.

Cedefop identifies this widespread process of *informatisation of work* as a main challenge to vocational education and training and wishes to contribute to the policy debate on arising competence needs by reporting on recent research.

Two new projects in this field were initiated by Cedefop in 1999. The present report is the outcome of one of them, undertaken by the University of Manchester. The project was carried out in the second half of 1999 and was linked to another project reporting on sector specific research. Two meetings were held in the autumn between those involved in the two projects, members of Cedefop and invited researchers and policymakers, to improve the quality of the outcome and ensure relevance to current policy debates.

The authors of the present report are Professor N. C. Boreham and Dr Norma Lammont from the human factors research group in the Faculty of Education at the University of Manchester.

The report strongly emphasises the importance for policymakers to address a wider range of learning needs that arise from the extended use of ICT. It also gives an overview of a wide range of issues of importance to the debate on competence needs.

It has not been a task for this project to report on research and developments regarding how the challenges arising from informatisation of work can be met by education and training systems. However, it has hopefully established a platform for further investigation into this core question from a lifelong learning perspective. It is Cedefop's hope that the issues reported on will provide valuable input to the ongoing debate, and also stimulate further research and, subsequently, provide concrete action for the parties involved.

Stavros Stavrou
Deputy Director

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Project Coordinator

TABLE OF CONTENTS

Cedefop preface 1

Table of contents 3

Executive summary 5

1: Introduction 9

2: The policy framework 13

3: The knowledge-based economy 17

4: New organisational forms 19

4.1: Telework 19

4.2: Distributed workplaces 21

4.3: The 'virtual' organisation 22

5: Informatisation 25

5.1: Informated work 25

5.2: The informated worker 27

6: Definitions of the skills gap 31

7: Definitions of skill and skills analysis 35

7.1: The many meanings of skilled work 35

7.2: Structural approaches to defining skills 36

7.2.1: Skill as a personal attribute 36

7.2.2: Skills in the job 37

7.2.2.1: Skill as complexity 37

7.2.2.2: Skill as discretion 37

7.2.3: Skill in the setting 38

7.2.3.1: Control of the labour supply 39

7.2.3.2: Internal regulation 39

7.2.3.3: Language and symbols 39

7.3: A psychological model of skill 40
7.3.1: Personal attributes 40
7.3.2: Personal skills 40
7.3.3: Technical or occupational skills 40
7.3.4: Discussion 41
7.4: An econometric interpretation 41
7.5: Critiques of reductionism in 'skills-list' approaches 43
7.6: Social construction of skill 44
7.6.1: Gender as a form of social closure 44
7.6.2: Stereotypes and technological work 44
7.6.3: Emotional labour and gender in informated service work 45
7.6.4: Other forms of stereotype 46
8: Segmentation of the labour market 47
9: The learning organisation 49
10: Bibliography 51
11: Internet and Web resources 57

Executive summary

Section 1 - Introduction

This report contains a critical review of recent and emerging research on the need for competences due to the widespread introduction of information and communication technologies into the workplace.

Section 2 - The policy framework

The aim is to provide material for the development of policies for vocational education and training, especially in the context of the European employment strategy.

The overall theme of the report is that programmes of vocational education and training should not focus narrowly on specific skills of using new technology. They should ensure that people have the wide range of skills needed to become employable in environments where ICT has been introduced.

Section 3 - The knowledge-based economy

The meaning of this can be appreciated by considering why ICT is spreading into more and more workplaces. Increasingly, it is recognised that economic success depends on the capacity of enterprises to create and exploit knowledge. ICT is an important tool in this endeavour. However, it is only one strand in an overall process of reorganising enterprises to ensure that they create and exploit knowledge more effectively. Strategies for vocation educational and training in this field should therefore address the whole range of demands this is making on people's capabilities.

Section 4 - New organisational forms

Telework is one example of how ICT has transformed work. Telework requires new technical skills, such as being able to configure and set up a computer system. However, it also requires skills such as managing client relations and self-marketing. Moreover, teleworkers face many problems, including the possibility of becoming out-of-date due to their isolation, and conflicts between the demands of home and working life. Programmes of education and training should deal with the whole range of needs.

Another impact of ICT is to enable organisations to reorganise their work geographically, distributing work stations throughout a network. However, the economic advantages of this are often counterbalanced by failures to manage the ICT infrastructure, and by the tendency to outrun employees' capabilities (for example, by overloading them with information). So in addition to training employees in the direct skills of remote work, there is a need to train managers to provide better support, and to design more effective person-machine interaction.

Virtual organisations, such as groupware overlays spanning existing productive structures, are another example of new organisational forms made possible by ICT. However, work in these environments requires more than expertise in the latest technology, video conferencing and so on. To benefit from the potential of ICT, the entire organisation must participate in knowledge sharing. Education and training in this field should view the technical skills and organisational development as inseparable parts of a single objective.

Section 5 - Informatisation

Informatisation is one of the most fundamental ways in which ICT is impacting on work. This term refers to the ability of new technology to create work-related information while the work is being performed. As a result, employees may require enhanced intellectual skills, and the ability to learn from information that is being constantly generated on the job. However, in informated working environments, it is not necessarily the case that all jobs are informated. A division of labour may be maintained between "symbolic analysts" and other employees who carry out less informated work. For many of the latter, the impact of ICT has resulted in peripheral and precarious employment, with little chance of learning in the workplace. Consequently, providers of vocational education and training must question the twin assumptions that the informatisation of work creates learning opportunities for all employees, and that all members of the information society can assume responsibility for developing their own skills.

Section 6 - Definition of the skills gap

The identification by policy-makers of a widespread need for education and training in ICT is based on evidence of skills gaps in organisations that rely heavily on new technology. However, there are methodological problems in collecting data about skills gaps, and there is a conceptual problem of confusing skills gaps with skills shortages and other recruitment difficulties. There is also fundamental uncertainty about whether ICT results in a growth in high-skilled jobs, or a growth in both high-skilled and low-skilled jobs, with less demand for jobs requiring an intermediate level of skill. These uncertainties need to be taken into account when planning strategies of vocational education and training.

Section 7 - Definition of skill and skills analysis

At the level of individual employees in working environments that make use of ICT, the identification of education and training needs depends on a clear definition of skill, and the use of appropriate methods for analysing the requirements of employment. However, the term "skill" is defined in many different ways by sociologists, psychologists and econometricians. Sometimes, it is defined in a reductionist way that empties it of its essential personal and contextual components. Because of this lack of an agreed scientific definition of skill, there is a danger that the level of skill accorded to certain kinds of work with ICT will reflect social stereotypes of the people who perform them.

Section 8 - Segmentation of the labour market

There is a considerable amount of evidence that the labour market in sectors that make use of ICT is segmented by gender. The more highly paid ICT jobs tend to be dominated by men, while women predominate in the less highly paid applications of the new technology. Education and training systems tend to reproduce this inequality.

Section 9 - The learning organisation

Many of the issues discussed in this report come together in the learning organisation. The basic assumption of the learning organisation is that greater competitiveness can be achieved by influencing the tacit knowledge that employees accumulate through experience, both individual knowledge and knowledge that is embedded in organisational routines. ICTs play a vital role in this. However, their potential will not be realised without securing the willing cooperation of the entire workforce in the process of innovation, and this will depend on effective labour-management relations. Strategies for vocational education and training, in addition to developing the specific skills of intranets and knowledge management software, should address the entire range of learning needs that these types of organisation create.

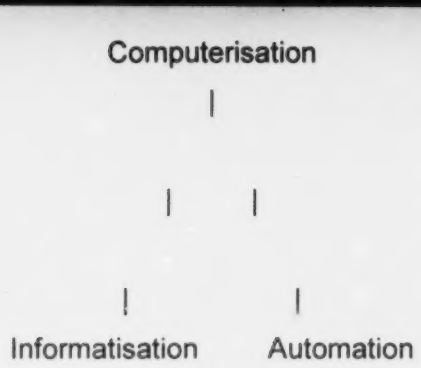
1: Introduction

All over Europe, knowledge is becoming an increasingly important resource, on which businesses draw to improve their competitive advantage. The exploitation of knowledge assets has been transformed by the introduction of ICT into all sectors of the economy. However, many employers now claim that there is a shortage of employees with the skills necessary for the new working practices which have accompanied the introduction of ICT into the workplace. Consequently, in September 1998, a high level summit on employment and training in the information society was organised to address the challenges which this presents to businesses and national systems of vocational education and training. The main focus of the summit was on training and development needs within the ICT sector itself, and on the competences which may be developed in higher education. The needs for competences in occupations traditionally not requiring higher education, while recognised, were not discussed in depth.

In this report for Cedefop, the authors hope to contribute to the debate on the competence needs at skilled-worker level arising from the widespread introduction of ICT into the workplace. The term "skilled worker" should be understood as an employee in an occupation which does not require higher education qualifications, who may be working in manufacturing, the service sector or emerging sectors such as ICT-based occupations which operate across different sectors.

The report is addressed to policy-makers in the fields of initial and lifelong education, human resource development within firms and employment services generally. The policy framework is the European employment strategy, whose guidelines stress (among other things) the need to develop ICT skills among school students and adults, in both formal and non-formal contexts. The report aims to inform the debate on how best to implement these guidelines at national and regional levels. It covers a wide range of issues raised by the apparently simple requirement to prepare skilled workers for the kinds of employment transformed by ICT.

The initial objective was to investigate key debates in different socio-economic perspectives on the nature of 'skill' in this context, and to define and analyse central concepts such as "informatisation", 'skilled work' and 'competencies'. In many ways, *informatisation* is the central concept here, although it is still finding its way slowly into the debates on training needs. The term was introduced by Zuboff (1990:9) in her book *In the age of the smart machine*. It refers to the capacity of computers, when they are brought onto the shop floor or into the office, to generate information about the work being done there. The difference between *informatisation* and *computerisation* is important, and can best explained in terms of a hierarchy:



By computerisation is meant the introduction of computers into the workplace. This has two kinds of impact. It can automate (e.g. computer programmes can direct the operations of machines, instead of the operator having to turn levers, etc.), and it can informate (e.g. the computer can generate information for the operator, by capturing and displaying large amounts of data about the production process).

Computerisation can both automate and informate – as when the operator of a computer-controlled production system is given access to data about the ongoing process, and is thus able to predict its evolution and diagnose its abnormalities. This creates the opportunity for the operator to become a system controller, rather than a machine minder. However, it is possible to computerise work without informating it – for example, if the computer is used to run a machine, but does not generate data about what the machine is doing. This difference is crucial for the debate on the skill needs arising from the introduction of ICT into workplaces. When computerisation informates, it requires a higher level of competence, demanding intellectual skills and communication skills in particular. However, when it automates without informating, the work may be deskilled. Zuboff (1990) regards the latter situation as a failure to capitalise on the potential of new technology.

In the course of the project, the researchers attended meetings with a wide range of policy-makers, practitioners, researchers, social partners, and of course, representatives of Cedefop. The round table discussions focused on two of the four pillars of the European employment strategy, employability and adaptability. These discussions provided researchers with valuable insights into current policy debates. For example, it was recognised that policy-making cannot be conducted solely at European level, because many of the problems of meeting skill needs arise at local level, and must be addressed by local initiatives.

Nevertheless, there are a number of *questions* which need to be addressed at all levels. The meetings with policy-makers brought these to the fore, and resulted in a broadening of the original objectives to include an investigation of skills shortages, labour market segregation along lines of qualifications, gender, age and other factors, and polarisation of the labour market according to different levels of participation in the information society. The goal of creating a Europe which offers equal opportunities and discourages restrictive employment practices, is a major concern of many policy debates in the European Union. Our own discussions showed convincingly that these debates cannot be separated from the debate about how to meet the skill needs created by the widespread introduction of

ICT into workplaces. It was decided, therefore, to investigate the broader issues mentioned above, and relate them to the central theme of reducing the European skills shortage in workplaces transformed by ICT.

The authors gratefully acknowledge the contribution to discussion by Michael Adams, Marc Ant, Gonny Blaauw, Antonio de la Cruz, Anna Gammaldi, Clare Johnson, Karsten Kruger, Hans Moerel, Barry Nyhan, Tim Oates, Giusy Chiovato Rambaldo, Clemens Romijn, Gerd Schienstock, Erik Schmidt and Antonius Schroeder. They also wish to express their thanks to Hilde Brodahl and Judith Pugh of Cedefop, for their dedicated management of the project from start to finish.

2: The policy framework

At the beginning of the new millennium, the European Union is experiencing many social and economic challenges, arising from the rapid liberalisation of international trade and financial markets and the development of new transport and telecommunications technologies. At the level of individual firms, the challenges are experienced as intense competition in product markets. Many firms find themselves competing for market share in their own countries against companies located abroad. This places them under pressure to change.

They respond to this challenge in different ways:

> Some will not make any changes and most of those will be wiped out by competition. Others will focus even more intently on reducing production costs by intensifying the division of labour and reinforcing discipline in the factory. Others will try to find more intelligent ways of organising production with the emphasis on exploiting the new opportunities offered by information technology, thereby reducing the costs and time it takes to transform inputs into attractive outputs while at the same time obtaining higher quality products. Finally, some will try to find ways to side-step the competition by introducing new products or services or tackling completely new markets.' (Lundvall and Borrás, 1999: p. 90).

In this environment, new qualities are demanded of employees. Emphasis is increasingly placed on the ability to work effectively in teams, to communicate with others both inside and outside the company, to assume responsibility, to be quality-conscious and to develop good customer relations. In addition, employers frequently expect employees to be able to deal with members of different cultures (including learning their language), and to use information and communication technologies.

The EU and national governments have introduced a spectrum of policies aimed at the twin goals of promoting competitiveness in international markets and maintaining social cohesion (in particular, protecting the losers in the global competition). A sense of urgency now informs the policy debates, because Europe's economic performance is declining relative to those of the US and many Asian countries. In comparison with these countries, European productivity growth is slow, and her competitiveness in international markets is weak.

Education and training play a prominent role in the new policies to achieve competitiveness. They stand level with R&D, technology and infrastructure policies. In part, this is due to a return to 'human capital theory', the doctrine that the knowledge and skills of a firm's employees are among its most important capital assets. Consequently, national systems of education and training are now given the task of generating human capital, and supplying it to the labour market.

The new role expected of education and training is described in numerous policy documents.

The EU Commission's white paper (1993) on *Growth, competitiveness and employment* proposed a number of policies to reverse the EU economy's poor performance. These included recommendations to improve the level of knowledge and skills in the youth labour force, and to make education and training available to support continual reeducation and retraining through the lifespan.

The white paper (1994) on *Teaching and learning: toward the earning society* stressed the need to anticipate and provide the new knowledge and skills the economy needs, especially competence in ICT.

The main context in which policy debates are taking place is the European employment strategy. This was initiated by the Treaty of Amsterdam in June 1997. The central aim of the strategy is to support Member States and social partners in their efforts to develop people's skills and potential for work. In the European Commission paper *the European employment strategy: investing in people, investing in more and better jobs*, attention is drawn to Europe's failure to handle the transformations in the labour market which have resulted from global competition. 'We have a good safety net against income loss during unemployment. But ... We don't have a springboard to new skills and jobs' (p. 4).

The employment strategy calls on Member States to coordinate their employment policies around four common 'pillars for action':

(a) employability – making sure people can develop the right skills to take up job opportunities in a fast-changing world;

(b) entrepreneurship – making it easier to start and run a business and to employ people in it;

(c) adaptability – developing new flexible ways of working;

(d) equal opportunities – equal access to jobs for women and men, equal treatment at work.

The employment strategy is implemented in an annual cycle known as the Luxembourg process, following its adoption at the Jobs Summit in Luxembourg in November 1997.

At the beginning of the year, the Council approves a set of employment guidelines for achieving the goals set out in the four 'pillars for action'.

Each Member State draws up a national action plan, in which it outlines how it will implement the guidelines in ways suited to its own situation. This process is expected to be based on broad consultations between social partners, employers, government, etc.

The Commission and the Council jointly examine each national action plan and present a joint employment report to the December European Council. The results are fed into the following year's guidelines.

In this way, a rolling programme of annual planning, monitoring and replanning is taken forward.

The main financial instrument for implementing the strategy is the European Social Fund (ESF). Established in 1957, the ESF deals with issues of employment and human resources, both within the regions and across the European Union as a whole. The new

Structural Fund Regulations covering the years 2000-06 will make the huge financial resources of the ESF available to implement the Employment Strategy, based on each country's national action plan.

The employment guidelines give a high priority to developing skills in ICT. The guidelines for 1999 state that:

> 'In order to reinforce the development of a skilled and adaptable workforce, both Member States and the social partners will endeavour to develop possibilities for lifelong learning, *particularly in the fields of information and communication technologies* ... easy access for older workers will be particularly important' (Guideline 6).

The employment guidelines for 2000 remain the same as the guidelines for 1999, with just five adjustments. One of these places 'a new emphasis' on 'promoting access to the Internet and the acquisition of skills in Information Technologies at school.'

The national action plans submitted to the Commission each year record many different ways in which Member States are promoting the acquisition of ICT competencies. Differences in approach reflect differences between the Member States' educational and labour market institutions. Nevertheless, there are a number of general issues arising from recent research which can inform the policy debate, at European, national and local levels. The need for education and training is created by the ways in which Europe's economies are responding to the challenges of globalisation. Consequently, the real need is to ensure that people are *employable in contexts into which ICT has been introduced as part of a general strategy to improve competitiveness*. There is tendency in some debates in this field to focus on competence in operating specific information and communication technologies. However, too narrow a focus may result in education and training overlooking the breadth of learning needs.

3: The knowledge-based economy

To understand the impact the widespread introduction of ICT is having on the skills needed in employment, it is necessary to consider work with ICT in its broader socio-economic context – especially its role in the knowledge economy.

Economic growth depends on the capacity of enterprises to create and exploit knowledge.

ICT helps enterprises to develop this capacity.

Education and training should prepare people for all aspects of work in industries that have been significantly changed by ICT, not just the skills of operating particular technologies.

Riley (1998) contends that we are moving from an age of information into the age of the mind, which will be characterised by new ways of interacting with information and knowledge.

In a review of literature on the 'knowledge society' Bohme (1997) maintains that this concept describes a social reality of advanced societies rather than a social trend. Various theories of the knowledge society are distinguished, including theories of the scientific-technological revolution; postindustrial society; intelligentsia as a class; and information, science, and knowledge societies. The contemporary knowledge society is characterised as one where knowledge as cultural capital has become a productive force, a major sector of the economy, a national and international power resource, and the basis of individual opportunity and social status.

Wilke (1998) examines the concept of knowledge-based work and its role as a core element in the transition from the industrial to the information society, focusing on a better understanding of the interaction of personal and organisational knowledge. Aspects and origins of the information society and their expression in the characteristics of 'intelligent' organisations are described. It is shown how the work of 'symbolic analysts' expands individuals' work to shape the operational modes of such organisations, whose functions centre around mobilising diverse and decentralised resources to meet customers' needs. This is seen in analysis of the operations of corporate consulting and financial services firms. It is argued that a revision of the theory of the firm is needed to encompass this transformation of knowledge into a critical factor in production that underlies the essential core competences of organisational learning and systemic innovation.

Paye (1996) argues that knowledge is a crucial factor in underpinning economic growth. Producing goods and services with high value added is at the core of improving European economic performance and international competitiveness. The fastest rates of growth are being recorded by high-technology manufacturing sectors, such as computers and aerospace, and knowledge-based services, for example finance and communications. Investments in R&D, computer software and the like have substantially grown in importance. Increasing intangible investment – which is difficult to measure – in the upgrading of skills and competencies of workers, has now become a major concern for enterprises and governments of Member States. Employment prospects are good for highly-skilled workers, but less promising for the low-skilled.

The development and diffusion of information technologies are central to the evolution of the knowledge-based economy. Increasingly, knowledge can be transformed into information, codified and transmitted through computer and communications networks. The costs of acquiring knowledge are lower, barriers to entry are being demolished, 'natural' monopolies are evaporating, and new products and services are being rapidly created. Shorter product life-cycles, quick obsolescence of skills and intensified globalisation are the results.

Paye goes on to remind us that in the knowledge-based economy the service sector is taking on a new role, emphasising the value of technology and the quality of human capital. Service industries, particularly finance, business and telecommunications, are the primary purchasers of ICTs. R&D spending by the service sector is growing faster than that of manufacturing, and now accounts for a quarter or more of the total in major economies. Most net job gains in the past decade have come from service industries, with particularly rapid growth in business and professional services. Advanced countries are now moving away from an emphasis on manufacturing towards expanding the knowledge-base of their economies.

As all sectors of the economy rely increasingly on knowledge, enhancing the skills of the labour force becomes a prerequisite to better economic performance in the EU. Lifelong learning is now a part of people's lives. Member States, in their national employment plans, have recognised the importance of encouraging more efficient and equitable strategies for skills development, including enterprise-based training, and formulating more flexible transitions between education, training and work over the working lifetime. Transforming these plans into reality requires policies which promote a better balance between investments in physical and human capital.

The knowledge-based economy will require considerable adjustment on the part of workers, organisations and the governments of Member States. It is characterised by rapid change and a requirement for flexibility. Growth in productivity, output and jobs must be built upon a foundation of technological progress combined with the development of human resources. Therefore, coherent policies for the knowledge-based economy must create incentives for expanded investment in human resources, technology, innovation and information networks. Effective government will rest increasingly on nurturing this knowledge base and promoting the adaptability of economies to swiftly-changing conditions.

4: New organisational forms

4.1: Telework

For a small but important part of the European economy, the coming of the new technology has resulted in new kinds of commercial organisations whose business is based primarily on ICT. Teleworking can be a powerful solution to a number of workplace problems, providing companies develop a communications policy for their employees, and provide them with training opportunities.

Teleworkers are people who work from home, using a variety of ICTs. They might be self-employed, or employees of an organisation. In the latter case, they might work for some of the time in their employer's office.

Telework has potential for further growth.

It offers employment opportunities for people who may be excluded from other types of employment.

Disadvantages for teleworkers include lack of differentiation between home and work, isolation, missing training opportunities and career development, the danger of becoming out-of-date, losing out on welfare benefits and lack of recognition in employment legislation.

Advantages include flexible hours, ability to combine paid work with other activities, autonomy, freedom from direct supervision and control over the pace and management of work.

Although telework requires technical skills, such as being able to configure and set up a computer system, workers also need a range of personal qualities (self-discipline, proactiveness), and all the non-technical skills of a self-employed person, such as managing client relations and self-marketing.

Haddon and Silverstone (1995) report on individuals who work from home using a variety of ICTs and services. The authors indicate that increasingly this is an option not only for managers and professionals, but also for those doing clerical work, such as data-entry, word processing, proof-reading and report writing. The amount of teleworking which takes place is difficult to measure at any one time and in any one society, because of different definitions of what constitutes telework. Another problem is that teleworkers, being hidden away in the home, have low visibility. However, there is evidence to suggest that the phenomenon is increasing, particularly among the self-employed (POST, 1995). Teleworking is also attracting attention among policy-makers, social partners and the media. This will serve to increase familiarity with the concept, and possibly its acceptability.

The EU green paper *Partnership for a new organisation of work* (1997) describes measures to develop and support telework. The paper reports that companies estimate the cost of supporting an executive with secretarial and administrative services approaches

three times the cost of their salary. Under certain kinds of individualised contracts, teleworkers are paid for a specified number of hours or days, which does not include the 'unproductive' time (e.g. breaks) that the normal working day inevitably contains. Staff working at home under this kind of arrangement effectively become self-employed contractors.

Earls (1997) points out that failure to address work and family issues undermines work efficiency and family life. Restructuring the way work gets done to address these issues can lead to positive results in retaining the services of valuable knowledge workers. Companies have become increasingly willing to accommodate employees with family responsibilities and are developing human resource policies to meet their employees' needs. Flexible work hours, onsite childcare and telecommuting are among the options being offered.

While people using computers to work at home enjoy their autonomy and self-reliance in the management of time and space, they resent the lack of distinct separation between work and leisure, family and business, personality and function (Castells, 1996; pp. 247). Haddon and Silverstone (1995) also agree that the potential of telework to allow teleworkers temporal and spatial flexibility is always constrained by social factors. The different spatial and temporal patterns which emerge, and the efforts to maintain the boundaries between work and home, have a bearing upon the time when ICTs are used. Clearly, work which spills over from the office into the home makes a difference to the culture of that home.

Some other reasons for the slow growth of this kind of activity are suggested by Wilson (1991) who gives particular attention to the problems which companies using telework have found in monitoring it. Managers have found difficulties in both monitoring and rewarding the efforts of the skilled professional workers who currently form the majority of those working in this way. Wilson also reports that the companies had to invest time and effort in maintaining the involvement of such workers in the organisation. Taken together this range of factors meant that using the services of skilled teleworkers is neither as simple or relatively cheap as many had envisaged. A study by Stanworth and Stanworth (1992) reinforces a view of teleworking as something which will probably develop slowly and sporadically. The researchers show that the preferred working pattern among teleworkers they studied was one in which people followed a combination of both home and office working. This gives individuals the benefits of flexibility in their own lifestyle, while avoiding a sense of isolation from others in the world of work.

Blake (1999) considers teleworking from the worker's point of view. Problems like isolation can be coped with by networking. Other problems for employees are reduced career prospects. Teleworkers feel they might not get the same opportunities for promotion as office-based colleagues because, being based at home they are 'invisible', and therefore they might not be informed when vacancies occur.

The writer stresses that teleworkers need to ensure their skills are kept up to date, and they are not left out of training programmes. In a constantly changing workforce, training becomes ever more important. Teleworkers not only need to be proficient at the particularities of their jobs, they also need a number of other skills. In addition to computer

literacy and good time management, they need good interpersonal skills to develop effective working relationships without face to face meetings. Self-employed teleworkers need the skills to market themselves and organise their finances. They also need to be able to market a service to a distant client. They have to be able to use telecommunications economically, and choose ICTs to suit the services they offer. It is also useful for them to be familiar with the legal/regulatory framework concerned with teleworking.

A vocational qualification in teleworking has been developed under the 'Teleworking for Europe' project, part-funded under the Euroform programme and developed at Moorlands Telecottage in the UK. The qualification is intended to equip the candidate with a platform of competence on which a service or skill can be overlaid. Course units include setting up and configuring a computer system, telecommunications and data transmission, information processing, text processing and self-management. Many courses are available from home, but outside courses provide a good opportunity for teleworkers to get outside the house and meet other people.

In concluding, Blake (1999) expresses fears that the workforce will polarise between a protected core (predominantly male) of full-time permanent employees with access to continuing staff development and benefits and a (predominantly female) periphery of casual workers who lack access to training, pensions and other benefits and are largely excluded from representations within the social dialogue.

4.2: Distributed workplaces

The advent of ICT enables companies to disaggregate their operations and distribute them to less expensive locations, or to outsource to low-cost satellites.

Firms are disaggregating primarily to save costs.

Consequently, European workers are exposed to competition from anywhere in the world.

The human cost to the increased competitiveness achieved by distributed organisations is lower employee security and stability.

There is increased pressure on workers in these organisations to continually update their skills.

Policies should balance the needs of the European economy to improve its competitiveness with the need to ensure quality of working life.

The most significant impact of ICTs on remote work is in facilitating the spatial reorganisation of the functions and personnel of the firm (Goddard, 1994; Goddard and Richardson, 1996). This trend began with banks, insurance firms and many other companies relocating clerical functions from back offices at their headquarters in major cities to areas outside the central business district, where human and business resources were available at lower costs (Moss, 1987; Richardson, 1994). Many enterprises now use call centres to provide telephone-based services and support to customers around the world.

Some geographically distributed firms have decided to centralise administrative functions, such as accounting and billing, sometimes by outsourcing the work. Leading edge companies are seeking to use the flexibility afforded by these kinds of teleaccess approaches to choose the most cost-effective places for carrying out necessary tasks, then networking them together into changing, virtual configurations. Teleaccess also allows new players from anywhere in the world to enter a market place, creating increased competition for local customers.

The opportunities to exploit geographical opportunities are reinforcing the vital role of ICT in all sectors of the economy. But, as teleaccess becomes more important to an organisation, so do the risks entailed with failures to manage the ICT infrastructure to support the access. Much of the rhetoric associated with concepts like BPR (business process engineering), TQM (total quality management) and virtual organisations emphasises the need for highly skilled, adaptable personnel who will 'multitask' across functional divides and respond effectively to rapidly-changing business needs. The design of ICTs therefore needs to respect the human capabilities and perceptions of users, as well as address business and technical areas.

There is empirical evidence to show that ICTs can increase demand for skilled staff, rather than deskill (Kraemer et al., 1981; Attewell & Rule, 1984; Webster 1996a). However, Peltu et al. (1996) warn us that even highly skilled and trained personnel can be overloaded with information by poorly designed systems. Information overload and difficulties in comprehending complex systems, particularly in stressful environments, have been at the root of a number of ICT failures and disasters.

The *Work life 2000* programme, sponsored by the Swedish National Institute for Working Life has organised a series of workshops to consider the effects of ICTs upon the qualitative aspects of working life. Gunilla Bradley (Information, 1999) reminds us that we do not yet know what the effects of intensification of work, the stress of electronic surveillance, information overload, and constant necessity to update skills will have upon individuals. In a parallel discussion (Bradley, 1998) the author criticises prevailing apathy, the result of technological determinism, which promotes learning to cope with 'technostress', rather than preventing it.

4.3: The 'virtual' organisation

One way to define a virtual organisation is as a computer-networked social mechanism capable of temporarily bringing together people, capital and technologies to engage in a collaborative productive activity. As such, virtual organisations may operate as groupware overlays across existing productive structures. Alternatively, they may be comprised of loose clustering of individuals and technologies with few formal traditional organisational ties.

A virtual organisation has few (if any) employees and little dedicated infrastructure.

When the demand for the product or service declines, the organisation dissolves.

22

Employees need creativity, business acumen and the ability to cope with uncertainty and the blurring of boundaries between work and home life.

The concept of the virtual organisation as an existing corporation but with many employees who 'telecommute' is one interpretation. However, Cohen (1997) points out that corporations considering adopting a virtual set-up should recognise that this strategy involves more than just setting up the latest technology. Importantly, cultural issues should be considered to ensure the success of such an endeavour. For example:

(a) How do workers in a virtual organisation communicate?

(b) How does management lead virtually?

(c) What does it mean for careers and the future of work?

The entire organisation should accept open communication, knowledge-sharing and autonomy to make a virtual operation a success. Coworkers will communicate by e-mail, telephone or video-conferencing, rather than face to face. Employees will spend most of their time on the road or working at home.

More radically, Barnatt (1997) describes virtual organisations as the ultimate form of organic organisation. The writer sees this as a dynamic network which pulls together requisite individuals, capital and technologies in a transitory fashion as and when required. Therefore, while at least the core of such a dynamic network may exist for years or even decades, virtual organisations will have no identifiable existence over time. By definition, they will have little or no dedicated infrastructure and few (if any) employees. Instead, both capital and labour will be contracted minimally, as required. Virtual organisations may therefore be just 'boxes of contracts' – data stores or lists of business acquaintances. Their business will be routed through cyberspace and their structures most readily exhibited on a computer screen.

Much of the literature concerning CMC (computer-mediated communication) is from an organisational perspective, and stems from studies of the introduction of computers into the workplace. The work of Rice and Love (1987), Rice and McDaniel (1987) and Sproull and Kiesler (1991) develops ideas about the changes which electronic mail brings to organisations. The main body of their work concerns patterns of interaction and communication through telecommuting, teleconferencing, e-mail and the like. It asks questions about management, work, and the future of traditional organisational structures, released from the conventional patterns of who talks to whom and about what.

There are two key elements to this form of analysis of CMC:

(a) it assumes that distance and space are to be centrally overcome and controlled, in the sense that technology will permit almost unlimited access to data and other people (Sproull and Kiesler, 1991; p. 116);

(b) which is almost contradictory to the first, is that there will be oversight and control of access.

The organisation of the future will depend significantly not just on how the technology of networking evolves, but also on how managers seize the opportunity it presents for transforming the structure of work (Sproull and Kiesler, 1991; pp. 23).

The issue, however, has less to do with the structure of work and more with the control of access to information and people. This is based upon the premise (found in CMC) that computers cut across boundaries and break down hierarchies. It is not unusual to find such assumptions when a new technology is put to use. Yet as Ross (1990) points out, there is a tendency to use new technology to form information elites.

Cohen (1997) makes the point that in common with teleworkers, virtual employees will need to be proactive about learning, interacting and communicating. Therefore self-discipline and goal orientation must be encouraged. Virtual employees will need new skills, such as the ability to write effective e-mail, use groupware, and work on virtual teams. Without a 'home base' many virtual workers may feel isolated and out of touch. To avoid feeling isolated and out of touch, employees should be encouraged to network with their peers to facilitate regular face-to-face contact.

Hammer and Champy describe the changes in cryptic terms:

> 'If the old model was simple jobs for simple people, the new one is complex jobs for smart people, which raises the bar for entry into the workplace.' (Hammer and Champy, 1993; p. 70).

5: Informatisation

The impact of ICT on work is often described as 'informatisation'. This refers to the ability of ICT to create information about work processes that have previously been obscure. Attempts have been made to characterise the 'informated' worker, and thereby identify core skills.

In informated environments, not all jobs are necessarily informated.

Informatisation may blur the boundaries between managers and operatives, and thus change relations in the workplace.

Many models of informated work have been proposed.

Some attempt to divide the workforce into categories, such as routine production, routine service, and symbolic-analytic.

5.1: Informated work

Zuboff (1988) considers the significance of the computer at work in terms of a traditional dilemma: either computer-controlled work will lead to the loss of traditional employment and increasingly hierarchical control, or it will provide the opportunity for revitalising work and enhancing its participatory control.

The author takes ICT to be qualitatively different from other forms of machine technology. While machine technology can automate, it merely acts upon the object. However, ICT is reflexive in the sense that it generates additional information, thus providing 'a deeper level of transparency to activities that had either been partly or completely opaque' (1988:9). In Zuboff's terms, ICT computerises as well as automates. It alters the intrinsic composition of work. For Zuboff, ICT marks the point of departure from an earlier industrial system to a informated one which requires mainly symbolic manipulation, and which implies that new knowledge may be acquired by the information process.

Zuboff construes computer technology as a revolutionary medium through which work is constructed, and through which either human self-realisation or human enslavement can be achieved. In terms of job-enrichment, she suggests that new technologies often require workers to use 'intellectual' skills. Rather than simply manipulating tools and other tangible objects, workers must respond to abstract, electronically-presented information. For this reason Zuboff suggests that computer technology offers the possibility of a radical break with the Taylorist tradition of work organisation, moving towards more skilled and rewarding jobs, and towards workplaces where learning is encouraged and rewarded. 'Learning is the new form of labour', she declares (p. 395).

In informated work – the application of intellectual skill to the interpretation of data in computer-mediated work – Zuboff argues that the computer mediates between the worker and the material upon which they operate in a way that is new. However, even while advocating this paradigm shift of more autonomy and intellectual development among workers, Zuboff acknowledges that sharing information and maximising opportunities for

25

all is felt by many managers to be a kind of treason. Her own fieldwork revealed managers who, fearful of losing their traditional monopoly over knowledge and power, suppressed rather than encouraged the empowerment potential of new technologies. More recently, trade unions have pointed out the contradiction between management rhetoric, which urges workers to assume responsibility, and the fact that they are often treated like children (Developing, 1998).

Webster (1995) remarks that information has come to be regarded as a symbol of the age in which we live, and we speak of living in an 'information society' and the 'informatisation' of work. The author sets out to make sense of the information explosion, and of what various analysts mean when they speak of the information society. He examines various approaches to informational developments, assesses their worth, and provides critical commentaries on the major 'grand' theories. Webster approaches informativeness from the standpoint of major social theory, in an attempt to demonstrate that the social impact approaches are hopelessly simplistic, and positively misleading for those who want to understand what is going on and what is likely to transpire in the future.

The author remains sceptical of perspectives on the information society which announce that we are living in a new age. He remarks on the unproblematical way in which the term tends to be used, especially outside social science. The writer believes in a informatisation of life which stems from the continuity of established trends. Therefore, the idea of a novel form of society which is a fundamental break from what has gone before is unsustainable. One reason is that so many of those who believe we are entering a new age use deterministic explanations and descriptions in singling out technology as the prime mover of change. While simultaneously, they claim that this technology is aloof from the realm of beliefs and values. The writer points out that the prophets of this point of view formulate it by enumerating phenomena which they consider to be characteristic of the 'new order'.

In his account of what he calls the 'control revolution', Beninger (1986) outlines the evolution of modern electronic surveillance from pre-industrial systems. The author argues that they are a continuation and acceleration of previous processes that began a century ago, reminding us:

> 'Microprocessor and computer technologies ... are not new forces only recently released upon an unprepared society, but merely the latest instalment in the continuing development of the control revolution.' (Beninger, 1986; Chap. vii).

Casey (1995) has proposed a model which refers broadly to changes on two levels:

(a) the first consists of the more readily observable changes such as those caused by the widespread effects of advanced automation and ICTs in the production of goods and services. This involves an integration of skills and knowledge work in production tasks, centralised control of the information process, finance and the reorganisation of the workplace. Additional factors are the displacement and dispersion of workers, occupational despecialisation, the growth of a polarised service sector and global markets. Moreover, the capacity of late 20th century technologically advanced societies to produce more with fewer workers is a significant post-industrial condition;

(b) the second level refers to the changes brought about by advanced computer technologies in the nature of production, in what is being produced and valued. Central among these changes is the commodification of knowledge (Lyotard, 1993) and information as the 'informated' workplace transforms production and product.

5.2: The informated worker

Discussing those who work in the information society, Reich (1992) maintains that the labour force of the future can be divided into three groups:

(a) routine production tasks such as the assembly of cars, fridges, TV sets, etc. where there are low education and skill requirements. These goods can in principle be produced anywhere and international capital will, of course, move to those countries where wage levels are lowest;

(b) routine individual services such as hairdressers, taxi drivers, cleaners, etc. where the work by definition must be performed in close proximity to the customer. These tasks are also, in the main, simple and repetitive but cannot be transferred to other countries;

(c) symbolic-analyst services such as problem identification and solving different types of strategic contracts involving new relationships and networks, some of which are international. Of these, only a small elite, perhaps 8%, will be the true analysts who produce the information, such as scientists, inventors, researchers, etc. These services are not tied to one country but can be performed anywhere, subject only to the requirement for linguistic skills.

Reich's work has attracted a number of critics, who assert that it is naive and clumsy to attempt to classify the entire workforce in this manner. Greenbaum (1998) contends that the tendency to apply the term 'knowledge' work to a whole spectrum of occupations, from executive, managerial and professional to clerical/administrative is not a useful one. It is argued that these occupations represent new 'knowledge' industries because they are based largely upon the gathering, applying and communication of information (Warhurst & Thompson, 1998). The characteristics of knowledge work can be found across a growing number of service-sector jobs including package delivery, telecommunications repair services and retail. The author argues that as labour is redivided geographically and horizontally, the older definitions of jobs and occupational categories are becoming blurred.

To illustrate the above argument, Hendry (1999) believes new technology industries to be at the heart of the knowledge-based economy because they exploit science and technology for industrial and social purposes. The author distinguishes the need for various levels of skill at three different stages of the implementation of new technology:

(a) in the first stage, the high-level skills of scientists who can work across disciplines where the fundamental properties of a new technology are being worked out;

(b) in the second phase, as the science and technology become more established, people who can work with the new technology and apply established production technologies and disciplines in fabrication and assembly;

(c) in the third phase, the established technology requires operators who can function in the informated environment.

During the phase when the new hybrid skills are being formed, such skill development may rely particularly on in-company development to convert people from the disciplines they have been educated or trained in. As the technology and methodologies become established, this may be externalised into the education and training system. Characterising and responding to the skill needs of a new technology-based industry therefore means understanding its stage of development. Cross-disciplinary knowledge and skills are essential to these industries, as are management and commercial skills to complement technological training.

Warhurst and Thompson (1998) examine the reality behind management rhetoric of the 'empowered' and 'informated' worker, pointing out that there is a considerable difference between consultants and 'symbolic analysts' (such as scientists, and engineers) and those employed on the lower levels of financial services, or employed in call centres and telesales. Much of this so-called 'informated' work is routine, stressful and extensively monitored for errors by supervisors. The authors point to a contradiction at the heart of the service encounter. In informated customer-oriented work, operators are required to deliver high-quality service, yet are simultaneously under pressure to deal with customers as quickly as possible. The very uncertainty that inevitably accompanies the human element drives management to attempt to standardise the encounter as a means of ensuring quality, or at least, consistency.

The writers point out that management has always sought to possess and control the 'knowledge' workers possess. It is argued that the knowledge worker is not a postindustrial phenomenon, but rather, an integral part of the development of industrial capitalism. Therefore it might be more useful to jettison the very broad notion of knowledge workers in favour of a more realistic appreciation of the growth of knowledgeability in work.

Forester (1992) believes that predictions on the role of ICTs in society have gone wrong because they have placed too great an emphasis on technology, and too little on human needs and abilities. Such sentiments were echoed in a recent *Work life 2000* workshop (Developing, 1998), which considered how the driving forces for the development of good work have changed over different periods. In Sweden and certain other countries, it is no longer the ideals of socio-technology and human-centred design that push the development of good work. Internationalisation, increased competition and other factors have led to pressure for organisational change, and the gradual acceptance of quality strategies such as TQM. These quality strategies contain within their rhetoric certain humanistic aspects on work design, and so, ideally, are potential driving forces towards enriched work. Jörgen Eklund (Developing, 1998) reported the results of quality initiatives where companies took a broad approach, involving employees and giving them more

responsibility, with positive results. However, other companies saw standardisation of quality in narrower terms, and in some cases this could result in unreasonable demands and risks to workers' health.

Kovaks (1998) presents a critical analysis of the approach to lifelong learning, particularly on-the-job learning, adopted in some of the European Commission's green and white papers, 1995/96. A challenge is raised to the assumption that inevitable development of the information society will lead to flexible production and companies, intelligent work, new skills, and more and better opportunities for learning. Rather, it is suggested that these opportunities vary significantly in function of the division of labour within companies and the particular work situation of employees. Given persistent unemployment, the proliferation of peripheral and precarious jobs and work situations that hardly favour learning, the benefits of transferring to individuals responsibility for constructing their own skills and updating their expertise are questioned.

6: Definitions of the skills gap

Statistics included in the EU employment rates report (1988) reveal that 20 years ago the EU's employment rate was 64%, whilst that of the US was 62%. By 1997, however, the EU rate had dropped to 60.5% and the US had increased to 74%, a spread of almost 14 percentage points – equivalent to about 34 million jobs.

Faced with Europe's employment problem, and evidence of skill shortages in organisations that use ICT, many policy-makers perceive a need to teach ICT skills to the entire workforce. However, it is important to appreciate that only a minority may need specific skills of this kind. Estimates of the magnitude of skills shortage, and its distribution across sectors, are based on a variety of types of data. Different sources of data use different definitions of skills shortages, and the overall picture is cloudy. There is a need for an agreed framework for distinguishing between skills gaps, skills shortages and other recruitment difficulties.

There is an urgent need to standardise terminology and ways of estimating skills shortages and gaps.

There are two major theories on the mismatch between ICT skill and the ability of people to supply them.

The job-skill mismatch theory implies that perceived shortages could be closed by training the whole workforce.

The polarisation theory states that the shift to a service economy creates growth in both high-skill and low-skill jobs, and a shortage of medium-skilled employment in the middle of the range.

A skill is defined as a useful ability which is relatively scarce, and therefore commands a premium in the labour market, either in the form of higher wages or superior work conditions (Glynn & Gospel, 1993; p. 1).

Skill acquisition has to be examined in terms of supply and demand in internal as well as external labour markets, and in both the short and long run (skills not available in the short run may be acquired or substituted in the long run). The acquisition of skills which are not innate involves costs which have to be overcome by incentives to the individual or the employer, or both. Human capital theory, as developed by Becker (1964) and others, provides many useful insights into how skills develop in a market context. In particular it focuses on investment decisions relating to skill acquisition and the allocation of costs between employers and individuals.

The acquisition and utilisation of skill may be constrained by both supply and demand side issues. A supply constraint involves a situation where skills could be sold at a premium in the existing market, but they have not been acquired because of individual, institutional, or market failure. A demand side constraint arises when skill which exists or could be developed, is not demanded. This is because markets are not available or are not perceived by entrepreneurs. Or it may be that employers discriminate against a particular

category of labour, such as women. Policy has tended to concentrate on the demand side of product markets (through monetary and fiscal policies) and the supply side of labour markets (through training and other policies).

The incentives created in the labour market in terms of earnings, employment terms and conditions, and career progression in part influence the skills which employers require. The skills which individuals acquire through education and training determine the supply of new skills flowing into the labour market, and the balance between supply and demand for different skills. The two markets are constantly interacting and any failure in one will inevitably affect the other.

Morris et al. (1994) review two current theories on skills mismatches:

(a) the job-skill mismatch thesis attributes rising inequality to growth in the number of high-skill, high-wage jobs, leaving less-skilled workers behind;

(b) the polarisation thesis argues that the service shift generates growth in the number of both high- and low-skilled jobs, and a decline in intermediate-skilled jobs.

The authors argue that while the evidence provides more support for the polarisation argument, this thesis needs refinement if it is to provide a basis for policy measures.

Some writers have pronounced upon the traditional survey methods for determining skill shortages which depend upon employers reporting vacancies (Kelleher, 1993; Green et al., 1998). They point out that such methodology cannot detect all shortages, nor can it reveal the content of skills missing in manufacturing.

Kelleher (1993) comments that firms rarely consider restructuring as a strategy for dealing with acute skill shortages because of institutionalised working barriers (e.g. demarcation) which hamper the adoption of new working practices. It is suggested that one method employers can utilise to alleviate skill shortages in the long term is to devolve tasks to lower-skilled groups of workers, and therefore free higher skilled workers of routine tasks in order to undertake higher-skilled tasks. Another method adopted by innovative companies with ICT vacancies is that of growing technical skills 'in-house' (Barron, 1999).

Green et al. (1998) offer an explanation of different definitions of 'skills shortage', based upon empirical questionnaire research of employers. They define three situations when:

(a) there are not enough people available in the labour market with the skills to do the jobs that need to be done;

(b) there is a difficulty in recruiting workers with the right skills;

(c) a firm's existing staff do not have the skills to do the job properly.

It has been demonstrated that what employers mean by skills (when they refer to skills shortages) also encompasses a range of behavioural attributes such as reliability, ability to work without supervision, and length of service. Research now generally recognises that both behavioural attributes and technical skills are included in the potential list of qualities that employers are looking for when recruiting (Bosworth et al., 1992).

Whilst most existing research and policy discussions tend to equate the notion of skill shortage with that of a hard-to-fill vacancy of one kind or another, the situation is more complex than this. Although there is considerable overlap between establishments with a skill shortage and those with a hard-to-fill vacancy, there are also a substantial number of establishments which fit into one or other category, but not into both.

However, as Green et al. remind us, there are some common factors determining the experience of skill shortages and/or the experience of a hard-to-fill vacancy (e.g. average wages). There are also notable differences between the processes determining the outcomes: lack of union recognition, establishment size, having a higher share of skilled workers in employment and whether the market of the establishment's product(s) is expanding. All these have differential impacts on the probability that an establishment has skills shortages or hard-to-fill vacancies.

The writer reports some overlap between the establishments reporting a skills shortage and those reporting some deficiencies in the 'qualities' of their existing employees. Although the degree of this overlap is not so strong as that between skill shortages and hard-to-fill vacancies, those with quality deficiencies were more likely than average to report a skill shortage. Yet many establishments with reported deficiencies in their *own workforce* did not apparently count these deficiencies as skill shortages, even when the quality deficiency was something as basic as literacy or numeracy. Some of the writer's other findings are:

(a) most employers own perceived indicators of skill shortages tend to refer directly or indirectly to concern with recruitment problems rather than shortcomings of their existing work force. The conclusion of Green et al. is that the term 'skill shortages' is not perceived in any uniform way by all employers;

(b) some relate this directly to hard-to-fill vacancies in their own organisations;

(c) others see the problem in wider terms than their own recruitment difficulties, referring to problems of lack of basic skills in applicants generally and skill shortages on a regional or national basis;

(d) other employers refer to skill deficiencies in their existing workforce;

(e) some employers give ambiguous responses.

Therefore studies that investigate the causes of 'skill shortages' need to pay serious attention to their measurement. If one is not certain of what is being measured, one can hardly feel confident about their findings.

7: Definitions of skill and skills analysis

When considering the training needs of the individual, there is a need for a better concept of skilled work. The traditional concept of the skilled worker was one who had completed an apprenticeship within a defined occupational category. However, this never applied to all sectors, nor to all countries. Where work has been affected by ICT, this is an even less satisfactory way of defining the skilled worker.

Skilled work is defined in may ways, and there is no objective definition.

Whether or not a particular job is designated as skilled may be the outcome of conflict between different occupational interest groups.

Skilled work is a complex concept, including elements of personal attributes, technical abilities, characteristics of the job, position in the firm and society, and value in the labour market.

There is a danger of adopting reductionist definitions of skilled work, not least because these empty the concept of its crucial personal and contextual aspects.

7.1: The many meanings of skilled work

Francis and Penn (1994) report the results of a survey, whereby respondents were asked the question 'What do you mean by a skilled job?' Respondents produced over 16 different definitions of what they believed to be skilled work. However, there was some convergence around five main characteristics: training, qualifications, apprenticeship, experience and high abilities. Their results are summarised below:

Feature of skilled work identified as important	Characteristics of respondents (statistically significant)
Apprenticeship	Older, male manual workers (particularly those possessing apprenticeship qualifications)
Training	Younger, female, public-sector employees (particularly those possessing higher-level qualifications)
Qualifications	Women (particularly in retail distribution) Younger respondents. People with lower-level qualifications.
High abilities	Men. People with higher-level qualifications.
Experience	No statistically significant relationships.

Source: Francis & Penn (1994)

The researchers concluded that different occupational groups will categorise skill in different ways, suggesting that a person's conception of skill is largely based upon their own experiences of employment. However, it would appear from examining these data that personal conception of skill is mediated by a complex range of variables, including gender and social stratification.

7.2: Structural approaches to defining skills

Noon and Blyton (1997) indicate that the concept of skill is fundamental to the status that people attach to different occupations, and is frequently linked to the level of economic reward. Moreover, the writers assert that skill is a key factor in the structure of employment, most notably in the way it acts to reinforce the gender division of labour in society.

Noon and Blyton consider three differing approaches to the analysis of skill:

(a) as an individual attribute of the person, which can be measured and quantified, say by tests or questionnaires. This is an analytical approach pursued by psychologists and economists;

(b) as an attribute of the job, and concerned with the requirement embedded in the task itself. This methodology is usually employed by management and industrial relations theorists;

(c) as a function of the political of historical setting in which work is situated, such as the way in which skill is constructed over time by different interest groups. This approach is favoured by sociologists and historians.

7.2.1: Skill as a personal attribute

The assumption is that skill is accrued by the individual as a product of accumulated education, training and experience. This approach is attractive because skill is viewed as an attribute easy to measure and quantify by tests. Many labour economists are satisfied with such measures as a proxy for skill. This so-called human capital theory, as developed by Becker (1964) and others, is considered to provide many useful insights into how skills develop in a market context. In particular, this theoretical approach sheds light on investment decisions relating to skill acquisition, and the allocation of costs between employers and individuals.

From this perspective, skill is considered to be a possession of the individual as an accrued product of education, training and experience. Human capital theorists see skills as indicators of an employee's value in the labour market. Certain kinds of skills and abilities are more valued than others, and therefore, more highly rewarded. It is argued that people can choose, as individuals, to increase their human capital through taking advantage of educational opportunities and training, or by acquiring qualifications.

From this perspective, responsibility for success in work rests with the individual, invoking the notion of a meritocratic society where individual labour is rewarded. The assumption is people compete on equal terms, and that everybody has the same access to opportunities

for improvement. A related point in this argument is that time invested in acquiring skill will pay off in the form of rewards, such as a fulfilling job and high wages.

It may be questioned whether variables of education, training and experience are valid measures of skill. It is the economic and technical context which determines the value of the skill. For example, skills can become obsolete – such as traditional hot metal composition in printing which was made redundant by informated technology. This method of quantifying skill is related to which skills are in demand by employers, and therefore have greater market value. In this sense all knowledge and abilities can be can be seen as potential skills but it is demand for them and their supply which gives them their market value.

Glynn and Gospel (1993) point out that skill acquisition has to be examined in terms of supply and demand in internal as well as external labour markets. The acquisition of skills which are not innate involves costs which have to be overcome by incentives to the individual or employer, or both. Kalaitzidakis (1997) presents an econometric model of the labour market in which workers differ in their ability to learn and implement new technologies. Firm-specific process innovations require companies to teach workers the organisation-specific skills introduced by the new technology. Therefore, companies seek to hire workers able to learn these required skills at least cost. From this perspective, the individual worker is valued according to their ability to learn at a fixed, predetermined rate.

7.2.2: Skills in the job

Two different aspects of skill are considered by Noon and Blyton: complexity and discretion.

7.2.2.1: Skill as complexity

The assumption is that it is possible to derive an objective measure of complexity. Noon and Blyton remark that if this were possible then jobs could be ranked according to their complexity, and linked to status and remuneration. In practice, this is extremely difficult, because evaluating job content is essentially a subjective experience. For example, to an observer, a job might appear complex simply because it is unfamiliar. There are problems in relying upon observation because of the subjectivity of the observer. Similarly, there are problems with asking the person performing the operation. The employee may undervalue the job because of their familiarity with its requirements, or overvalue it in an attempt to impress the observer.

7.2.2.2: Skill as discretion

This takes account of how much control an employee has over their own (and others') work. Discretion is about choosing between alternate courses of action – the greater the amount of decisions the greater the skill level. In this way, skill levels may be assessed by examining the scope for judgement within the work. However, all jobs require some discretion to be exercised, even though these facets of a task may not be formally

identified in job descriptions or acknowledged in the reward system. Another aspect of discretion is the time span during which an employee is permitted to operate without supervision.

Investigating the 'demand-control' model, in which aspects of autonomy can be measured against the demands of the work, Töres Theorell explained that high demands and little control are considered to result in the worst and most stressful conditions (Measure, 1998). Low demands and high control, on the other hand, lead to a relaxed job, which can be rather monotonous. Jobs with high demands combined with a high degree of control are classed as active. They are often interesting and self-improving, as opposed to passive jobs with little control and low demands.

Noon and Blyton contend that discretion is a misleading indicator because it fails to take into account the interdependence of many jobs in advanced industrial systems.

From this perspective, both complexity and discretion emphasise skill as being primarily about the requirements of the job. Skill is therefore seen as an objective feature of work which is measurable through an analysis of job content, both in terms of technical complexity and discretionary requirements. Consequently, analysts tend to view skill as consisting of subcomponents, each of which can be quantified. This is the reasoning which underlies descriptive econometrics, which devises models and uses them as a conceptual framework to explore, say, skill changes brought about by new technology for different occupational groups.

In assessing these approaches, Noon and Blyton point out that an assumption underlying both 'skill in the job' and 'skills in the person' approaches is that the concept of skill can be objectively defined or quantified. In this sense, both approaches purport to be entirely rational, ignoring the subjective and reflexive aspects of skill, or their historical development. However, conceptions of skill are not dispassionately developed, but socially and politically negotiated over time. They reflect the power and status of various interest groups, and contextual social factors present in the work setting and occupational culture generally.

7.2.3: Skill in the setting

This dimension includes the evaluations placed on particular kinds of activity, and on particular sets of individuals by various interest groups (e.g. employers, economists, trade unions). Focus shifts to the employment relationship itself, and to the notion of 'social closure' whereby people with a shared interest protect themselves by acting collectively to form a group which is in some way demarcated (e.g. a professional association or trade union). Entry to the group is regulated by existing members. Therefore, they may opt to include or exclude outsiders depending upon whether or not it serves their interest.

This discussion explores skill by focusing upon the role of social partners.

7.2.3.1: Control of the labour supply

Members of an occupational group wish to create a premium price for their work, since a scarcity of appropriately 'skilled' employees will push up a wage that an employer is willing to pay to secure their labour power. This can be achieved by regulating entry into the occupation to those who are deemed to be appropriately skilled workers, and conferring upon them a specialised status and market value.

The labour supply can also be regulated by employment of temporary workers on fixed term contracts, who do not have the same rights or status as 'core' workers on permanent contracts.

7.2.3.2: Internal regulation

Control of training can be achieved, for example, via a lengthy apprenticeship system which both slows entry and socialises newcomers. This can be a statement that the job requires accumulation of great knowledge and technical ability, thereby helping to enhance skilled status. Therefore, skilled workers function as a kind of labour aristocracy, emphasising craft and exclusiveness and attempting to ensure that jobs defined as 'skilled' are filled only by appropriately qualified persons. In this situation tasks become clearly demarcated and based upon formally negotiated agreements.

7.2.3.3: Language and symbols

For a group wishing to lay claim to status, it is in their interest to mystify and obscure work to portray an image of complexity. This can involve specialised language, and the use of impenetrable jargon, as in computing. New entrants are reminded by the use of language that they are on the periphery of the occupation, thus exposing their naivety of the setting. Initiation to full status is often by way of rituals and rites of passage (Noon & Delbridge, 1993). Or skill in using the tools of the trade (Steiger, 1993) can be an important aspect in defining skill, especially when the tools are technologically complex.

Therefore, Noon and Blyton offer the theory that the overall process of occupational social closure is composed of three interacting subprocesses:

(a) an ideological process whereby individuals recognise a shared set of values and beliefs and reinforce these symbolically;

(b) a political process, whereby group members act collectively, combining their resources in pursuit of common goals, e.g. in trade union membership;

(c) a material process whereby members seeks to appropriate the tools and technology of the work process, and exercise control or influence over the work situation.

The writers argue that the three processes operate concurrently and are mutually reinforcing, but that social closure is achieved only when all three are enacted. However, there is a dynamic aspect, and closure can be lost by the undermining of one or more of the processes. For example, the political base can suffer as a result of a legislative attack upon trade-union activity, or the material base by the introduction of new technology which alters or destroys demarcation and the constellations of valued skills.

7.3: A psychological model of skill

Dench (1997) suggests an alternative classification of skills. The author identifies three broad areas of skill:

(a) personal attributes and aptitudes;

(b) personal skills;

(c) technical skills.

7.3.1: Personal attributes

These refer to innate personality characteristics such as honesty, integrity, etc. Employers are placing increasing emphasis upon people who have the right 'attitude' and can 'fit in' to the existing workforce, and sometimes place this as a priority above technical skills.

7.3.2: Personal skills

While many of the skills needed to make people employable refer to specific occupations, employers are increasingly defining a set of 'generic' or personal skills which they seek when recruiting new employees. These generic skills include such things as:

(a) communication skills;

(b) basic literacy and numeracy and their application in a work situation;

(c) being a 'team player';

(d) ability to relate to customers or clients;

(e) taking initiative for one's own work and personal and career development;

(f) taking responsibility and making decisions;

(g) problem-solving.

Personal skills are seen as being related to personal attributes, in the sense that these can be developed and built upon.

7.3.3: Technical or occupational skills

These may be seen as important but employers often state that technical ICT skills can often be learned on the job and that getting people with the right kinds of personal skills is more important. For example, the Harley Davidson company place such a premium upon possession of 'soft' skills that they are prepared to recruit promising applicants, even if they are light on technical skills (Manufacturing, 1999; p. 1).

7.3.4: Discussion

Although these skills are not new requirements in many workplaces, they do appear to be receiving greater emphasis as organisations change and adjust to meet new competitive situations and develop new working practices. Thus, there may be an overlap between technical and personal skills used to provide a good service, as in informated customer service and retail work.

There is some debate over the extent to which these skills can be developed, or whether certain characteristics of predisposition are necessary for their development. Many organisations are adapting their recruitment processes and internal appraisal systems to explore more fully the abilities of potential recruits in these areas.

7.4: An econometric interpretation

Relating these ideas to human capital theory, Green (1999) considers how generic skills are valued in the market place. Occupational psychologists define the following 'generic' skills: verbal, manual, problem-solving and checking, numerical, planning, client communication, horizontal communication, professional communication, computing, autonomy, variety and organised teamworking.

The writer argues that with the exception of manual skills, greater skills are deployed by persons in higher status occupations and occupational groups. Research results in three European countries, France, Germany and the UK, were compared with those of the US. The main findings of generic link with market value are:

(a) **computer skills** even at moderate level of complexity (e.g. word processing) are highly valued and workers earn a premium of about 13% compared to those who do not use computers at all. More complex computer skills earn a still higher premium. The wage premium arises because employees with IT skills can credibly threaten to quit for higher wages elsewhere. The higher pay may partly reflect the costs individuals have to bear to obtain IT skills, thus constituting a normal return on that investment. The premium signals the scarcity that arises when supply lags behind demand, and thus acts as an incentive for more individuals to acquire these skills;

(b) **numerical skills** have no index link with pay, other than being associated with more complex computer usage;

(c) **professional communication and problem-solving skills** are also positively valued at 5% for women, 6% for men;

(d) **verbal skills** carry a premium for women, although to a lesser extent;

(e) **planning, client communication and horizontal communication skills** have no independent association with pay;

(f) **jobs involving greater variety** also earn more pay, but there is no strong evidence that greater autonomy is positively rewarded;

(g) **organising teamskills** exhibit tentative evidence of being able to attract a pay premium. The evidence is tentative because it appears not to matter whether much or little of the work is organised in teams, only that some of it is teamwork.

In terms of market premium, Green argues that this signals the scarcity that arises when supply lags behind demand, and thus acts as an incentive for more individuals to acquire these skills (IT). There is also a functioning market where several skills, notably problem-solving, professional communication, and the skills associated with a variety of tasks (e.g. multiskilling) are said to be increasingly dominant.

Hendry (1999) cites the frequent references to employer needs for generic skills and competencies, the right 'attitude', and the difficulty of finding people with these characteristics. These types of skill are most commonly associated with service organisations, and the need to communicate with and handle customers. However, the requirement for these types of skill is also becoming important in manufacturing, where employers seek employees with the ability and willingness to learn, to update constantly their knowledge and skills. The ability to cooperate in autonomous teams is vital in manufacturing organisations which have adopted cellular production processes and just-in-time practices.

Green observes that many interpersonal skills have a 'tacit' character that, notwithstanding policy-makers' recognition of the importance of acquired competences, are not easily certified. Equally, several skills cannot be fully codified and acquired in formal training. Workers who deploy such skills in their existing jobs may not be able to signal these abilities adequately to their potential employers. Despite the most advanced psychometric and other techniques, recruiting remains a far from perfect art, and people are generally matched by the traditional mix of qualifications (often as an initial screening device), experience, and interview. Under these circumstances a worker who has an abundance of a tacit skill may find it difficult or impossible to signal the fact to lever up their wage. With computer usage, by contrast, this is fairly easy for employees to signal, and for recruiters to determine their capabilities. Many interpersonal skills, for the most part uncertifiable, are harder to demonstrate.

The practical significance of this difference between openly observed skills and less easily certified skills is that, with the latter, it may be unwise to rely on a skills market to provide incentives to individuals to learn sufficient skills. Successful companies may do well, instead, to devise routines to develop and transfer tacit skills and knowledge as part of their regular work.

7.5: Critiques of reductionism in 'skills-list' approaches

Jones (1994) has identified two distinct approaches to the issue of competences:

(a) a behaviourist model which equates competence with performance, based on 'skills inventories' derived via functional analysis. The assumption is that jobs can be defined in terms of the functions required for adequate performance. The intention is to provide a mechanism for cost-effective and rapid skills-based training and for assessment of performance;

(b) an holistic model which has been considered within the writings of qualitative sociologists. This approach emphasises contextual aspects of competences, and treats the lists of skills as indices, pointing to some broader text of social practice.

Therefore, there is a fundamental difference in the ways in which the two paradigms treat competences as descriptors of social interaction.

The author is critical of the behaviourist approach to competence, arguing that it lacks sophistication and reflexivity. The approach rigidly recontextualises behaviour within a value structure which identifies some behaviours as competent, and others as less so, with no regard to the context within which they are exhibited. Accordingly, Jones argues for an understanding of the context of what constitutes good working practice, the dynamic and hierarchical nature of the learning environment and the importance of informal networks in contributing to work process knowledge acquisition.

Grieco (1987) conducted a series of ethnographic studies into the effects of informal networks for the transfer of information and tacit skills that enable individuals to gain competence and acceptance in their workplace. This included support, especially during the early stages of their employment when new recruits require a degree of 'carrying' by more experienced workmates. The author argues that the kinds of 'attitudinal' qualities evident in such day-to-day working practices and integral to effective functioning are very much overlooked by the 'skills list' approach to competence.

Generally, the idea that there are 'transferable' skills holds out the hope of producing a flexible workforce and solving the problems of training people for an uncertain future. Some researchers have concluded that belief in the existence of all-encompassing, generic key skills is based on nothing more than wishful thinking (Hyland, 1998; Johnson, 1998).

Johnson (1998) asserts that the skills movement places an over-emphasis upon skills and threatens rich and deep conceptions of teaching, knowledge and the individual. The writer argues that those who only possess techniques or 'knacks' do not understand what is really required to be done.

7.6: Social construction of skill

There is an ongoing process of social closure embedded in the power of occupational groups and their institutions to include some people and exclude others (Noon and Blyton, 1997).

7.6.1: Gender as a form of social closure

Phillips and Taylor (1986) conclude that it is the sex of those who do the work, rather than the content of it, which leads it to be defined as skilled or unskilled (1986; p. 63) When men and women work in a similar workplace doing similar jobs, men are more likely to achieve skilled status. Where new work processes are introduced allowing employers to deem some jobs 'female' from the start, work then tends to be classified as low-skilled, not by virtue of the skills required to do it but because of the inferior status of the women who perform it. Thus, the general pattern in the labour market is an undervaluation of work where females predominate, or of the skills which are deemed to be feminine (Horrell et al., 1994; Neathey, 1992; Steinberg, 1990).

Noon and Blyton (1997) remark upon the extent that social skills are often taken for granted and undervalued by employers. Therefore, they argue that job evaluation systems have been constructed to embed cultural assumptions about what constitutes skilled and responsible work in a way that significantly benefits men through the work they have historically performed. The authors also point to the part played by trade unions in providing the means by which male workers can organise and exclude women from their trades.

7.6.2: Stereotypes and technological work

Several researchers have explored the material aspects of male domination in the ways in which men appropriate the tools and technology which give them advantage in constructing notions of what constitutes skilled work, and conceal them behind a cachet of technical mystification. Cockburn (1983, 1985, 1986) demonstrates that the physical differences between males and females are often exaggerated. She also argues that men have historically acquired control over technology and work processes, perpetuating existing patterns of dominance. Wajcman (1991) insists that machinery is designed by men for male use, and thus reflects a gender-centricity which often results in tools being too bulky or heavy for the average woman. However, this need not be so. Clarke (1989) shows how the increased availability of female labour in Sweden prompted Volvo to invest in the design of ergonomic tools suited to the 'average' woman, and to develop hydraulic lifting devices to lessen the physical requirements for vehicle assembly.

Stereotypes of who produce and use ICTs can be particularly misleading. The belief that computers are produced by males for males is rooted in the early history of the personal computer, but also in the male gender imbalance of computer science departments, electronic discussion groups, computer clubs, etc. This stereotype ignores the extent to which women work with ICTs in organisations, and the decisive influence that socialisation in the family and workplace can play in shaping gender affinities towards technical artefacts.

7.6.3: Emotional labour and gender in informated service work

Some writers remark that the growth of telecommunications service work has created opportunities for some workers to take on a broader range of responsibilities. An example of this is bank clerks, who now give advice to customers over the telephone on a wider range of financial products and act as personal bankers (Hendry, 1999). However, other theorists have examined a darker side of these new 'informated' service environments, touching upon the need for workers to perform 'emotional labour'. Pressure to conform to the required norms is exerted by electronic surveillance systems which generate individualised data on employee performances, and employee interactions with customers are constantly monitored by supervisors. Emotional labour is defined as:

> 'To publicly display an emotion that they may not necessarily feel as a routine everyday part of work' (Wharton and Ericson, 1993; p. 208).

Taylor (1998) argues that the emergence of a new workplace within the service sector – shaped by the implementation of management concerns such as TQM and widely informed by the discourse of enterprise and the culture of the customer – has facilitated detailed managerial attention to the delivery of functional quality. The very emergence of the new workplace within the service sector as a whole has entailed a managerial focus away from the 'technical' aspects of service delivery towards a concentration upon the *way* in which services are delivered. This functional quality is now the basis for competition within the service sector.

Presenting evidence from an ethnographic study of an airline reservation system, the writer discusses the consequences for this in terms of the emotional labour demanded from service employees during their direct interaction with external customers. The discourse of enterprise advocates that for business success the workforce be 'empowered' to add value to the company and themselves. Ideally employees devise and implement their own individual ways of delivering functional quality, which include feelings management. The exercise of this discretion is encouraged and positively rewarded (in financial and symbolic terms) by management. This is what the emotional empowerment intrinsic to the new service sector workplace consists of.

Taylor strongly criticises the idealistic picture of an 'empowered' and 'autonomous' employee within the new service sector, and rejects it as a serious misrepresentation of reality. Given this greater managerial attention to the nature of employee/customer interaction, demands for service employees to 'surface act' and 'deep act' (Hochschild, 1983) have become inscribed within selection and training processes, supervisory and evaluative systems. In fact as the (functional) quality competition increases, service sector employers are increasingly demanding that employees deep act – actively work on and change their inner feelings to match the display required by the labour process – to meet the perceived need of external customers.

Overlaying the notion of 'service' are often particular assumptions of socially-constructed forms of behaviour involving gender, age, social status and other variables (Hochschild, 1983; Gabriel, 1988). The identities, appearances or even emotions of workers are vitally important to the delivery of many services (Hochschild, 1983; Leidner, 1991; Adkins, 1995; Tyler and Abbott, 1998).

Utilising a feminist critique, Belt et al. (1999) report on data obtained from fieldwork carried out in 13 call centres in 1998 in Ireland, the Netherlands and the UK. Using call centres as a paradigm of the new informated service work, the authors raise broader questions about the changing nature of women's work in the service economy. It is argued that some areas of work have become sex-typed as women's work, not only because it is carried out by a predominantly female workforce, but because call centre managers are capitalising upon stereotypical 'feminine' qualities and capabilities. Specifically, women are being recruited to call centre jobs for their 'teamworking' and 'communication' skills and their ability to 'smile down the phone' (Marshall and Richardson, 1996; McDowell and Court, 1997). Although these qualities are valued by call centre employers, the nature of work organisation in which ICTs are used to routinise and rationalise the labour process, limits women's promotional prospects and opportunities for skill development. One study estimated that 70% of call centre jobs in the UK were taken by women (Mitial, 1998).

7.6.4: Other forms of stereotype

Stereotypes are constructed not only in terms of gender, but also around such variables as age. Older workers are often unflatteringly depicted as having skills which are out-of-date, and being unable to learn as quickly and effectively as younger workers. Strangleman and Roberts (1999) present a case study in which following the adoption of quality initiatives older 'time served' males suffered a loss of status and autonomy. Although many of the newly-appointed (younger) workers could not handle the full range of difficulties inherent in the task, the objections of experienced workers were effectively marginalised by management rhetoric, which characterised them as 'dinosaurs' who were nearing extinction.

On a micro level, Webster (1996b) issues a warning that producer and user organisations that fail to create a supportive culture for groups such as people with disabilities and older employees, will risk the loss of vital talent and creativity. On a macro level, some Member States already have in place comprehensive mechanisms to help groups in danger of being excluded. For example, the Swedish government has introduced the 'Knowledge lift' programme, designed to help adult learners, including older workers whose skills have become obsolete or who have experienced 'skills fade' during a period of unemployment (Arbetsmarknadsstyelsen, 1997).

8: Segmentation of the labour market

The malleable nature of the concept of skill leads to demarcations between skilled and non-skilled work, which reflect inequalities of various groups. Therefore, a prosperous labour market may conceal disparities along the lines of gender, age, ethnicity, etc. For example, Van Baalen and Hoogendorn (1999) present statistical evidence of a booming economy which exhibits striking differences in growth between sectors, along the lines of gender, age, prior education and ethnicity.

There is a stereotype which equates competence in ICT with maleness.

Feminist writers argue that this stereotype is ingrained by child-rearing customs.

Women working with ICTs tend to be operatives, while technicians and engineers are overwhelmingly male.

This disparity is reproduced when opportunities for training, retraining and promotion are related to different grades of employee.

It is suggested that new theories of technology, inspired by feminist insights, should address the extent to which technology enters into gendered identity (i.e. the association between technological competence and gender) and the implication of technology in power and domination.

Webster (1994) and Webster and Burgess (1997) review changes in the workplaces of women since information technologies were first introduced in the late 1970s. The perspective adopted argues that gender and technology are mutually constitutive, such that changes in one shape what takes place in the other. Since its invention, computing has been developed along a gendered division in expertise, culture and values. These have resulted in new computer-based technologies that reproduce the sexual division of labour. Thus women's employment is rendered more informal, and women workers more disposable; a result of unequal bargaining power in the workplace.

Initiatives by women in computer systems are reviewed as efforts to incorporate their values into technology design and use. Despite the positive experiences of these initiatives, significant problems have arisen. Some of these centre upon time commitments, disjunction between systems designers and workers, and failure to embed themselves in the organisational culture in which they were introduced. It is argued that, by identifying the gendered processes of technology invention and introduction, feminist studies have recognised the diversity of women's workplace experiences and produced valuable data.

There is a powerful association between men, machinery and the concept of technical competence. Children learn early on that computing is male territory. Male computer hacks are accused of indulging male fantasies of sport, adventure and violence through the design of games of speed, war and 'alien zapping' (Wajcman, 1991; p.118) In her study of women and men working in three fields where new technology had been introduced and in the engineering firms which developed these technologies, Cockburn (1986) found that men continued to be the 'technologists' and women the lower paid 'operators'. The author points out that few skilled technologists are women.

Wajcman (1991) argues cogently that technology is a cultural product integral to the constitution of male identity. She underlines the significance of this technological 'ownership' as a source of power in gender relations. Therefore in seeking access to training for IT women and men do not start from equal positions.

Access to training is, potentially the means by which traditionally disadvantaged groups can increase their marketability. Ironically, training systems tend to be as segregated as the labour force itself, further exacerbating patterns of segregation. It has been argued that women's access to training and employment opportunities in high level IT where skill shortages are growing is compounded by the growing masculinisation of technologies (Cockburn, 1985, Wajcman, 1991).

In her investigation of engineering, Cockburn (1986) reports that women are often passed over for technical training and retraining and opportunities for promotion, because they are considered physically unsuitable for the work. This becomes a self-fulfilling prophesy, whereby women may avoid applying for training in technological occupations and locate themselves instead within feminised sectors. Demos (1999) examined a training programme intended to prepare women with limited education for service-sector jobs. Training focused on the development of social skills, including politeness, the ability to perform emotional labour and impression management. The writer concludes that while in the short term, the training provides welfare-reliant women with an opportunity to secure paid work, they are being channelled into a segment of the labour market where rewards and advancement are limited, thus perpetuating and recreating gender inequality in the workplace.

The assumption that the development of enhanced skills appropriate to advanced technologies is an important means of increasing the employability of the socially excluded is tested through case studies (based on 1995 fieldwork) in the food industry in Austria, the Federal Republic of Germany, and the UK (Flecker, 1998). Findings indicate that organisational restructuring, technological change, and redeployment of labour have very different consequences for women and men. In all three countries, the restructuring of work and skills increased the marginalisation of women, reinforcing gender differentiation.

9: The learning organisation

The need for competitiveness in organisations in which ICT has been introduced can only be achieved by learning in the workplace in the broadest sense. The learning organisation captures this concept.

This shows the necessity to tap the tacit knowledge which is embedded within work practices, and to leverage it to provide competitive advantage for the company.

ICTs play a vital role in capturing tacit knowledge which has been made explicit, and preserving it in organisational memory.

Workplace learning needs to be supported by the development of appropriate policy measures to encourage the development of tacit skills, and their recognition in formal systems of qualifications.

This will require the willing cooperation of the workforce.

It will therefore be vital to develop good workplace relations within organisations.

Contemporary concepts of the learning organisation owe much to Nonaka (1991), who produced a simple and elegant model to account for the generation of knowledge in the 'knowledge creating company.' This is based on the organisational interaction between 'explicit knowledge' and 'tacit knowledge' as the source of innovation. Nonaka argues that much of the knowledge accumulated in the firm is made out of experience or organisational memory (Conklin, 1992), Therefore it cannot be communicated by workers under traditional, extensively formalised management procedures. And yet the sources of innovation multiply when organisations are able to establish bridges to transfer tacit into explicit knowledge, explicit into tacit knowledge, tacit into tacit, and explicit into explicit. By doing so, worker experience is communicated and amplified to increase the formal body of knowledge in the company. Also, knowledge generated in the outside world can be incorporated into the tacit habits of workers, enabling them to work out their own uses, and to improve on the standard procedures.

Mariani and Parlangeli (1999) report on a study of informated work in an Italian continuous process environment. In this organisation, the knowledge of trainees was considered to be a valuable resource for contributing to the development of good practice. Trainees were encouraged to make observations and ask questions of experienced operatives. This provided an opportunity for the free exchange of ideas, uninhibited by occupational status within the organisation. The authors explain that it also encouraged the experienced operatives to actively reflect upon their own practices, and to consider how these might be improved. While this teaching role placed extra pressure upon the experienced operatives, it also served as an incentive for them to keep their knowledge and skills up to date, and not to become stale.

Adler and Cole (1993) argue that in an economic system where innovation is critical, the organisational ability to increase its sources from all forms of knowledge becomes the foundation of the innovative firm. Online communication and informated storage capacity have become powerful tools in developing the complexity of organisational links between tacit and explicit knowledge. This organisational process requires the full cooperation of

workers in the innovation process so that they do not keep their tacit knowledge solely for their own benefit. It also requires stability of the labour force in the company. Only then will individual workers be willing to transfer their knowledge to the company and for the company to diffuse it among all workers (Senge, 1990; Oppermann, 1996). Thus, this apparently simple mechanism lies at the root of a profound transformation of management-labour relationships.

To illustrate this argument, we offer two case studies.

Shaiken (1995) describes two modern, highly productive automobile factories. These organisations have integrated the most advanced computer-based machinery in their operations, and have simultaneously transformed the organisation of work and management. Both plants organise production in work teams with a flat occupational classification system, where workers are able to proceed with considerable freedom. The author argues that this high performance is based upon new technological tools, combined with high levels of knowledge and skill in an experienced and highly autonomous labour force. Another key factor is guaranteed job security and labour union participation in negotiating and implementing the reorganisation of work.

Zell (1997) provides an ethnographic account of how managers at the Hewlett Packard personal computer division tapped their employees' know-how to redesign their organisation so they could successfully compete in the new economic order. The employees engaged in redesigning their own work systems, and became partners in the process to produce an organisation that could learn from its environment. Managers and employees struggled to share power, expand their thinking and learn new behaviours.

We see in these examples from very different industries (car production and personal computers) many of the conditions set down by Nonaka's (1991) model have been put into practice. Drake (1998) warns that it is unrealistic to attempt to describe a universal model of the new firm, and attempt to apply this model to practical real-world situations regardless of context. Nevertheless, certain salient characteristics of the successful, learning organisation can be discerned. Forward-looking companies are often characterised by corporate restructuring towards flatter, looser configurations, devolution of managerial responsibility, and greater flexibility and skill in the workforce. The network character of information production permeates the whole firm, and requires constant interaction and processing of information between workers, workers and management, and humans and machines.

As these case studies illustrate, the nature of the informated work process calls for cooperation, teamwork, workers' autonomy and responsibility, based upon cooperative management-labour relationships. Without these elements, the potential of ICTs cannot be fulfilled. Education and training should therefore address the wider range of learning needs arising from these issues.

10: Bibliography

Adkins, L (1995) *gendered work, sexuality and the labour market,* Buckingham: open university press.

Adler, P.S. & Cole, R (1993) 'Designed for learning: a tale of two auto plants'. *Sloan Management Review.* Spring 1993: p.85-94.

Arbetsmarknadsstyrelsen (1997) Swedish National Labour Market Board, press release Nov. 24, 44/97.

Attewell, P & Rule, J (1984) 'Computing and organisations: what we know and what we don't know'. *Communications of the ACM.* 27 (12): 1184-92.

Barnatt, C (1997) *Challenging reality: in search of the future organisation.* London: John Wiley.

Barron, T (1999) 'Wooing IT workers' *Training and Development.* 53 (4): 20-26.

Becker, G (1964) *Human capital.* New York: National Bureau of Economic Research.

Belt, V et al. (1999) 'Smiling down the phone: women's work at telephone call centres.' *Conference on Call Centres, Centre for Economic Performance,* London School of Economics, March, 1999.

Beninger, J. R. (1986) *The control revolution.* Cambridge, Mass.: Harvard University Press.

Blake, M (1999) 'Teleworking: the teleworkers' perspective' *European Journal of Engineering for Information Society Applications.* Feb. 1 (2): 10-16.

Bohme, G (1997) 'The structures and prospects of knowledge society'. *Social Science Information/Information sur les sciences sociales,* Sept. 36 (3): 447-468.

Bosworth, D et al. (1992) 'Introduction' In D. Bosworth et al. (eds.) *Skill shortages: causes and consequences.* Aldershot: Averbury.

Bradley, G (1998) 'How we will live, learn and work.' 4th IFIP-WG9 2 Namur Award Celebration, Namur, Belgium Jan.1998.

<http://www.itk.mh.se/institutionen/personal/hemsidor/gunbra.html>

Casey, C (1995) *Work, Self and Society: After Industrialism.* London & New York: Routledge.

Castells, M (1996) *The Rise of the Network Society.* London: Blackwell.

Clarke, T (1989) 'Imaginative flexibility in production engineering: the Volvo Uddevalla plant,' paper to *Employment Research Unit Conference, Cardiff Business School.*

Cockburn, C (1983) *Brothers: Male Dominance and Technological Change.* London: Pluto Press.

Cockburn, C (1985) *Machinery of Dominance: Women, Men and Technical Know-how.* London: Pluto Press.

Cockburn, C (1986) 'The material of male power' Feminist Review (ed.) *Waged Work – a reader.* London: Virago.

Cohen, S (1997) 'On becoming virtual.' *Training & Development.* May. 51 (5): 30-8.

Conklin, E. J. (1992) 'Capturing organizational memory.' In C. Coleman (ed.) *Groupware '92.* San Francisco: Morgan Kaufmann.

Demos, E (1999) 'From Ghetto to Glamour: Teller Training Teaches Labor Tricks of the Trade' *American Sociological Association (ASA),* 1999.

Dench, S (1997) 'Changing skill needs: what makes people employable?' *Industrial and Commercial Training.* 29 (6): 190-93.

Developing Work and Quality Improvement Strategies (1998) Workshop organised by the National Institute for Working Life, Nov. 19-21, 1998, Brussels, as part of the Work Life 2000 Project. Worklife 2000, workshop article.

Drake, K (1998) 'Human resource accountancy in enterprises: recent practices and new developments'. *Enterprise Value in the Knowledge Economy. Measuring performance in the age of intangibles.* New York: OECD/Ernst & Young Centre for Business Innovation.

Earls, A. R. (1997) 'True friends of the family.' *Computerworld.* Feb. 17; 31 (7): 83-5.

EMPLOYMENT RATES REPORT (1998) Employment performance in the European Union. Luxembourg, 1998.

<http://www.europa.int/comm/dg05/empl&esf/empl99/rates_en.htm>

European Employment Strategy: Investing in People, Investing in More and Better Jobs , [The] (1999) DG Employment, Industrial and Social Affairs. Luxembourg: Office for Official Publications of the European Commission.

Flecker, J et al. (1998) 'The sexual division of labour in process manufacturing: economic restructuring, training and 'women's work'' *European Journal of Industrial Relations.* 4 (1): 7-34.

Forester, T (1992) 'Whatever happened to the information revolution in the workplace?' In MD Normann et al. (eds) *Computers, Ethics and Society.* Oxford: Oxford University Press 1997.

Francis, B & R Penn (1994) 'Towards a phenomenology of skills' in R. Penn et al. (eds.) *Skills and occupational change.* Oxford: Oxford University Press.

Freeman, C (1995) 'The case for technological determinism.' In R Finnegan et al. (eds) *Information Technology: Social Issues.* London: Hotter & Stoughton. 7th ed.

Gabriel, Y (1988) *Working Lives in Catering.* London: Routledge.

Glynn, S & H gospel (1993) 'Britain's low skill equilibrium: a problem of demand?' *Industrial Relations Journal.* Jun. 24 (2): 112-28.

Goddard, J (1994) 'ICTs, space and place' In R Mansell (ed.) *The New Telecommunications: a Political Economy of Network Evolution.* 274-85 .

Goddard, J. B. & R Richardson (1996) 'Why geography will still matter: what jobs go where?', in Dutton, W. H. (ed.) With M. Peltu (1996). *Information and Communication Technologies: Visions and Realities*. Oxford: Oxford University Press. 197-214.

Green, F (1999) *The Market Value of Generic Skills*. Dfee, Skills Task Force Research Paper No. 8.

Green, F et al. (1998) 'The meaning and determinants of skills shortages'. *Oxford Bulletin of Economics and Statistics*. 60 (2): 165-185.

Greenbaum, J (1998) 'The times they are a' changing: dividing and recombining labour through computer systems.' In P Thompson &C Warhurst (eds.) *Workplaces of the Future*. New York: Macmillan Business.

Grieco, M (1987) *Keeping It in the Family*. London: Tavistock.

Growth, Competitiveness and Employment: the challenges and way forward into the 21st century (1993) COM (93) 700 final Dec. 1993.

Haddon, L & R Silverstone (1995) 'Telework and the changing relationship of home and work.' In Heap, N. et. al (eds.) *Information technology and society*. Open University: Sage.

Hammer, M & J Champy (1993) *Reengineering the Corporation*. New York: Harper Business.

Hendry, C (1999) *New Technology Industries*. Dfee, Skills Task Force Research Paper, 10. Sept. 1999.

Hochschild, A R (1983) *The Managed Heart: the Commercialisation of Human Feeling*. Berkeley: University of California.

Horrell, S et al. (1994) 'Gender and skills' In R. Penn et al. (eds) *Skill and Occupational Change*. Oxford: Oxford University Press.

Huws, U (1984) 'New technology homeworkers.' *Employment Gazette*. 92 (1): 13-17.

Hyland, T (1998) 'Skill scam.' *Guardian Education*. Tues. 14 Jul: 2-3.

Information and Communication Technology, Work Organisation and Human Beings (1999) Workshop organised by the National Institute for Working Life, Brussels, Mar. 15-17, 1999 as part of the Work Life 2000 Project. Work Life 2000, workshop article.

<http://niwi.se/w12000/workshops/workshop24/article%Fen.asp>

Johnson, S (1998) 'Skills, Socrates and the Sophists: learning from history' *British Journal of Educational Studies*. 46 (2): 201-13.

Jones, L (1994) 'nvqs, competency and the acquisition of work process knowledge: a theoretical perspective.' *Seminar in Work Process Knowledge, University of Manchester, 15-17 December 1994*.

Kalaitzidakis, P (1997) 'On-the-job training of firm-specific innovations and worker heterogeneity.' *Industrial Relations*. Jul. 36 (3): 371-92.

Kelleher, M (1993) *Skills shortages and work reorganisation in British manufacturing*. Ph.D. Thesis, University of Bath. 43-8760.

Kovaks, I (1998) 'Trabajo, cualificaciones y aprendizaje a lo largo de la vida.' Ilusiones y problemas de la sociedad de la informacion.' (Life-Long Work, Skills and Learning. Illusions and Problems of the Information Society) *Sociologia del Trabajo,* Fall, 34: 3-25.

Kraemer, K L et al. (1981) *The Management of Information Systems*. New York: Columbia University Press.

Leidner, R (1991) 'Selling hamburgers, selling insurance: gender, work and identity.' *Gender and Society*. 5: 154-77.

Living and Working in the Information Society – People First. Green paper COM (96) final adopted on 24 July 1996.

Lundvall, B-A & S Borrás (1999) *The Globalising Learning Economy: Implications for Innovation Policy*. DG XII Science, Research and Development, Luxembourg: Office for the Official Publications of the European Communities.

Lyotard, J F (1993) *Political Writings*. Transl. B. Readings & K Geiman. New York: UCL Press.

Mcdowell, L & G Court (1997) 'Missing subjects: gender, sexuality and power in Merchant Banking.' L. Mcdowell and JP Sharp (eds.) *Space, Gender and Knowledge: Feminist Readings*. London: Arnold. 368-83.

'Manufacturing's Moods: demand for IT skills varies at some of the manufacturing's top companies'. (1999) *Computerworld*. Apr. 26 pna.

Mariani, M & O Parlangeli (1999) 'Newcomers' training as an opportunity for improved knowledge management and some controversial aspects of apprenticeship.' *European Educational Research Association Conference, Lahti, Finland, September 22-25, 1999*.

Marshall, J N & R Richardson (1996) 'The impact of telemediated services on corporate structures: the example of 'branchless' retail banking in Britain'. *Environment and Planning*. A28: 1843-1858.

Measure Psychosocial Factors in Working Life, [To] (1998) Workshop organised by the National Institute for Working life, Aug. 24-26, Copenhagen 1998 as part of the Work Life 2000 Project. Work Life 2000, workshop article and scientific report.

<http://192.121.1/6.100/w12000/workshop

Mitial (1998) *European Location Study: Call Centres in the UK, Republic of Ireland, Belgium and the Netherlands*. Wrexham: Mitial Market Research.

Morris, M et al. (1994) 'Economic inequality: new methods for new trends' *American Sociological Review*, Apr. 59 (2): 205-219. IS.

Moss, ML (1987)'Telecommunications and the economic development of cities' W H Dutton (ed.) (1999) *Society on the Line: Information Politics in the Digital Age*. Oxford: Oxford University Press.

Neathey, F (1992) 'Job assessment, job evaluation and equal value'. P. Khan & E Meehan (eds.) *Equal Value/Comparable Work in the UK and the USA*. Basingstoke: Macmillan.

Nonaka, I (1991) 'The knowledge-creating company.' In *Harvard Business Review*. Nov-Dec.: 96-104.

Noon, M & P Blyton (1997) *The Realities of Work*. New York: Macmillan Business.

Noon, M & R Delbridge (1993) 'News from behind my hand: gossip in organisations.' *Organisation Studies.'* 14 (1): 23-36.

Oppermann, R (1996) 'Supporting continuous learning' TRG Green et al. *Cognition and the worksystem, Proceedings of the 8th European Conference on Cognitive Ergonomics, Granada, Spain 10-13 September*.

Partnership for a New Organisation of Work Green Paper (COM (97) 128).

Paye, J C (1996) 'Policies for a knowledge-based economy.' *OECD Observer*. Jun-Jul. 200:4-6.

Peltu, M et al. (1996) 'Computer power and human limits' in W H Dutton (ed.) (1999) *Society on the Line: information politics in the digital age*. Oxford: Oxford University Press.

Phillips, A & B Taylor (1986) 'Sex and skill' Feminist Review (ed.) *Waged Work – a reader*. London: Virago.

Post (1995) Parliamentary Office of Science and Technology, working at a distance: UK Teleworking and its implications. London: POST, House of Commons.

Reich, R (1992) *The Work of Nations: Preparing Ourselves for the 21st Century*. New York: Vintage.

Rice, RE & G Love (1987) 'Electronic emotion: socioemotional content in a computer mediated communication network.' *Communication Research* 14: 85-108.

Rice RE & B McDaniel (1987) Managing Organisational Innovation: the Evolution from Word Processing to Office Information Systems.' New York: Columbia University Press.

Richardson, R (1994) 'Back officing front office functions – organisational and locational implications of new telemediated services.' In R Mansell (ed.) *The New Telecommunications: a Political Economy of Network Evolution*. New York: Doubleday. 309-35 .

Riley, B (1998) 'You are now entering the Age of the Mind: thoughts on the knowledge society.' *Australian Library Journal*, May 47 (2): 145-56.

ROSS, A (1990) 'Hacking away at the counterculture.' *Postmodern culture*. 1 (1): 1-43.

Senge, PM (1990) *The Fifth Discipline*. New York: Doubleday.

Shaiken, H (1995) 'Experienced workers and high-performance work organisation: a case study of two automobile assembly plants.' *Paper presented at the Industrial Relations Research Association Annual Meetings, Washington DC, January 6*.

Sproull, L & S Kiesler (1991) 'Computers, networks and work.' *Scientific American*. Sept.:116-23.

Stanworth, J & C Stanworth (1992) *Telework: the Human Resource Implications*. London: IPM.

Steiger, TL (1993) 'Construction skill and skill construction'. *Work, Employment and Society*. 7 (4): 535-60.

Steinburg, R L (1990) 'Social construction of skill'. *Work and Occupations*. 17 (4): 449-82.

Strangleman, T & I Roberts (1999) 'Looking through the window of opportunity: the cultural cleansing of workplace identity.' *Work, Employment & Society*. 33 (1): 47-67.

Taylor, S (1998) 'Emotional labour and the new workplace.' P Thompson & C. Warhurst (eds) *Workplaces of the future*. London: Macmillan.

Teaching and Learning: Toward the Learning Society (1995) White. paper. Luxembourg: Office for Official Publications of the European Commission.

Tyler, M & P Abbott (1998) 'Chocs away: weight watching in the contemporary airline industry'. *Sociology*. 32 (3): 433-50.

Van Baalen, P & J Hoogendorn (1999) 'Training and development in the Dutch context: an overture to the knowledge society?' *Industrial and Commercial Training*. 31 (2): 61-71.

Wajcman, J (1991) *Feminism Confronts Technology*. Oxford: Polity.

Warhurst, C & P Thompson (1998) 'Hands, hearts and minds: changing work and workers at the end of the century' In P Thompson & C Warhurst (eds.) *Workplaces of the Future*. Macmillan Business, 1-39.

Webster, F (1995) *Theories of the Information Society*. London & New York: Routledge.

Webster, J (1994) 'Gender and technology at work: 15 years on.' *IFIP Transactions in Computer Science and Technology*. A57: 311-24.

Webster, J (1996a) 'Revolution in the office? Implications for women's paid work' W H Dutton (ed.) (1999) *Society on the Line: Information Politics in the Digital Age*. Oxford: Oxford University Press.

Webster, J (1996b) *Shaping Women's Work: Gender, Employment and Information Technology*. London: Longman.

Webster, J & R Burgess (1997) *Shaping women's work: gender, employment and information*. Addison Wesley Longman, New York.

Wharton, AS & RJ Erikson (1993) 'Managing emotions on the job and at home: understanding the consequences of multiple emotional roles.' *Academy of Management Journal*. 18: 457-86.

Wilke, H (1998) 'Organisierte Wissensarbeit' (Organised Knowledge-Based Work) *Zeitschrift fur Soziologie*, Jun. 27 (3): 161-177.

Wilson, A (1991) *Teleworking: flexibility for a few*. Brighton, Institute of Manpower Studies.

Zell, D (1997) *Changing by design: organisational innovation at Hewlett-Packard*. Ithaca and London, Cornell University Press, ILR Press.

Zuboff, S (1988) *In the Age of the Smart Machine*. New York, Basic Books.

11: Internet and web resources

Vocational and educational research

Cedefop: European Centre for the Development of Vocational Training. The Electronic Training Village. Information on VET networks and educational projects across Europe, including a library of electronic documents.

http://www.trainingvillage.gr

Survey on new skills, competences and qualifications in Europe.

http://www.b.shuttle.de/wifo/key/!survey.htm

CERI, Centre for Educational Research and Innovation: carries out studies and promotes an international dialogue about education in OECD countries. Site includes online documents relating to a programme on ICT and qualitative learning.

http://www.oecd.org/els/edu/ceri/index.htm

EERA Links: a cross-national and by-country guide to websites which contain information of interest to those doing high quality educational research.

http://www.eera.ac.uk/links.html

By area

EUROPEAN SOURCES

ADAPT & Employment Community Initiatives: assists the EU DG for Employment, Industrial Relations and Social Affairs in the implementation of initiatives on employment projects and research. Site contains a database and downloadable documents on telework, women's entrepreneurship, emerging organisational forms, etc.

http://www.europs.be/docs/listdocs.cfm?idPS=9&CAT=ALL&LANG=1

Centre for Economic Policy Research: a European-wide research network covering 210 institutions in 25 countries.

http://www.cepr.org/11_ns.htm.

Cordis: the European Community R&D information service, provides information on a vast range of research, development and innovation activities on a European level. Cordis offers different types of research databases, including a searchable document library, background and policy information on EU research and innovation.

http://www.cordis.lu

Homepages of specific research programmes.

http://cordis.lu/info/frames/if006_en.htm

The site also contains an extensive series of useful links to organisations throughout Europe, Japan and the USA.

http://www.cordis.lu/cybercafe/src/ris.htm

EEO, European Employment Observatory: in English, French and German, the site offers electronic retrievals on European employment policies.

http://www.ias-berlin.de/ias/first/1english.htm

Eucris, European current research information systems: a gateway to information on research in higher education across Europe, including Canada, USA, Japan and Israel.

http://www.nsd.uib.no/english/research/eucris/

Euratin: European research and technology information network.

http://www.euratin.net

Eureka: promotes pan-European, market-oriented research and development across 30 European countries.

http://www.eureka.be/

Europa: the multilingual website of the European Communities contains a wealth of material on EU policy, with links to the research projects of the various directorates, as well as research institutes throughout Europe. A large number of EU policy documents, papers and council communications are available for downloading.

http://europa.eu.int/

Nordic sources

Links to Nordic countries including news of research projects, publications, current news and events.

http://www.uta.fi/laitokset/tyoelama/UKvalikko.html

By country

Austria: data exchange on research projects and institutions.

http://derpi.tuwien.ac.at/

Belgium: IWETO: Flemish research information.

http://www.vlaanderen.be/IWETO/DOCS/thema_pag.html

Denmark: The Dandok database presents an overall picture of research in progress and published Danish research.

http://www.risoe.dk/dandokbas/

Finland: Innovation relay centres.

http://www.cordis.lu/irc/src/whos-ewho/fi.htm

RUSE, Research Unit for Sociology of Education. A gateway to international research sources, including links to journal archives and databases, research units and associations, government departments and international organisations.

http://www.utu.fi/erill/RUSE/link.htm

Research reports from RUSE (downloadable, mostly Finnish, many with English summary).

http://www.utu.fi/erill/RUSE/rap.htm

Tampere University, work research centre: supports and promotes research into various aspects of work and the quality of working life.

http://www.uta.fi/laitokset/tyoelama/WRC.html

France: CNRS – Centre National de la Recherche Scientifique.

http://www.urec.fr

Germany: KoWi – Information service for German researchers and the EU liaison office of the German research organisations.

http://www.kowi.de

Greece: Ariadne – the largest physics and sciences research establishment in Greece.

http://hellas.ariadne-t.gr/

Ireland: Forbairt – an organisation established to provide services to Irish industry across a wide range of commercial activities, including management development, innovation, finance and technology transfer.

http://www.forbairt.ie/

Italy: Consiglio Nazionale delle Ricerche.

http:www.cnr.it/

Luxembourg: Innovation relay centre.

http://www.cordis.lu/irc/src/whoswho/lu.htm

The Netherlands: Dutch research database.

http://.niwi.knaw.nl/us/nod.htm

Universiteit Maastricht: the Faculty of Economics and Business Administration contains a library of downloadable documents (in Dutch and English) including many dealing with labour-market/skills issues from an economic perspective.

http://www-edocs.unimaas.nl/general/fdewb.htm

Portugal: Innovation relay centre.

http://www.adi.pt

Spain: Bases de datos documentales.

http://www.cicyt.es/wais.html

Innovation relay centre.

http://www.cordis.lu/irc/src/whoswho/es.htm

Sweden: Swedish current research information system.

http://cris.idc.lu.se/

Swedish EC/R&D Council.

http://.www.eufou.se/english/serviceindex_english.html

Stockholm Univessitat: Institute for International Economic Studies. Series of downloadable seminar papers.

http://www.iies.su/se

Stockholm School of Economics Library: SWOBA, Swedish working papers in business administration – downloadable documents (mostly in English with some in Swedish) covering labour market/skills issues.

http://swoba.hhs.se/

United Kingdom: Joint home page of the UK research councils.

http://.www.nerc.ac.uk/research-councils/

ASLIB, Association for Information Management: promoting best practice in the management of information resources, professional development training, conferences and specialist recruitment. The site contains electronic journals.

http://aslib.co.uk/aslib/man-inf/current/book1.html

Department of Education and Employment: government papers and policy documents available to download.

http://www.dfee.gov.uk/othaddr.htm

Skills task force: publishes reports on all aspects of skills and skills shortages, economic changes and likely skills needs in the UK economy. A large number of downloadable papers and reports available.

http://.www.dfee.gov.uk/skillsforce/1.htm

Special subjects

European Telework Online: tools for teleworkers.

http://www.eto.org.uk/links/tools4tw.htm

International Labour Organisation, International Institute for Labour Studies: includes a number of downloadable publications on labour institutions and technological change, education and research.

http://www.ilo.org/public/english/130inst/papers/

Literature review on work process knowledge in technological and organisational development, 1998-2000 (N Lammont) – accessible from the EU WHOLE website. This substantial document includes sections covering: perspectives on skills and competences, knowledge and learning in the workplace, lifelong and self-learning, and organisational changes resulting from impact of new technology.

http://www.man.ac.uk/education/euwhole/home.htm

VIPS: a scientific press service on research results (5 languages) The VIPS services also offers users up to date information on RTD projects in various fields, including ICTs.

http://www.cordis.lu/VIP/vip.pl?language=en&sort=s&node=/

VIRTUAL SOCIETY: links to virtual organisation sources and research on virtual society.

http://www.comp.lancs.ac.uk/sociology/VSOC/VRbanklinks.html

Global access

http://www.urec.fr/France/web_monde.html

http://vlib.stanford.edu/Servers.html

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The need for competences due to the increasing use of information and communication technologies

The widespread introduction of information and communication technologies (ICT) is affecting the skills needed in employment. When training and development needs are identified, ICT should be seen as one aspect of the complex process of transition to a knowledge-based economy, not as a purely technological phenomenon. Consequently, while there is need to train people to work directly with the new technologies, there is also a need to help them adjust to the accompanying changes in working life. Developing the competences needed to work in businesses whose organisational structures and working practices have changed to accommodate ICT demands a more sophisticated understanding of skilled work. New combinations of personal attributes and technical abilities are required, and traditional occupational categories and qualifications are becoming less relevant. In this time of flux, the designation of employees in ICT-rich environments as skilled – and the training and career opportunities that go with it – should not be permitted to reproduce the disparities of gender, age and ethnicity that already stratify the labour force. The problem of skills shortages, skills gaps and other recruitment difficulties in sectors which make use of ICT require policies that integrate training and development with measures to improve the quality of working life and eliminate structural barriers to full participation in the knowledge economy.

N.C. Boreham and Norma Lammont

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